AMERICAN DYESTUFF REPORTER

"Circulated Everywhere Dyestuffs Are Used"

Published by Howes Publishing Company, 90 William Street, New York

Devoted to the practical application of dyestuffs in all industries; especially to textile chemistry—the science and practice of scouring, bleaching, dyeing and finishing.

Volume XVIII | NEW YORK, MAY 27, 1929 | No. 9

Fiber Flax and Rayon Fabrics

Historical and Economical Considerations—Flax-Rayon Mixtures—Research on Flax—Dyeing of Rayon-Linen Fabrics—The Sulphur Dyes for Linen-Rayon Mixtures—Aftertreatment—Dyeing With the Soledons and Caledons

By FRED. GROVE-PALMER, A. I. C.

FABRICS which are composed of any of the different kinds of rayon woven together with either of the vegetable fibers are well known throughout the textile world, and perhaps none of these mixtures has proved more successful in the limited production so far attained than those in which fiber flax has been used in conjunction with the synthetic yarns.

Historical and Economic Consideration

"Fiber flax," says Frank C. Miles, of the Bureau of Plant Industry, Washington, D. C., "was grown in North America from the earliest colonial times until homespun linens were displaced by mill-manufactured cottons, between 1820 and 1850. In the development of American agriculture to large-scale production, fiber flax, for which there were no efficient machines to replace hand labor, could not compete with other crops. No fine linens are manufactured in this country, and most of the 5,000 to 8,000 tons of flax fiber used annually in the American mills for making shoe thread, sewing thread, twines and toweling is imported.

"This country offers the best market in the world for linen goods. The importations of manufactured linens have increased from about $20,000,000 annually in pre-war years to more than $50,000,000 in 1924.

"Conditions of soil and climate are favorable for the cultivation of fiber flax in the northern part of the United States, where there is sufficient rainfall, and, with labor-saving machinery and improved methods for harvesting, threshing, retting and scutching, this crop is now competing successfully with other crops in limited areas in Michigan and Oregon."

Some figures taken from the latest edition of the Commerce Year Book (United States Department of Commerce) will be found to have an interesting bearing upon this as regards the alteration in home production:

IMPORTATIONS

(Thousands of Dollars)

	1910–14	1925	1926	1927
Flax, unmanufactured	3,361	3,376	3,261	2,154
Woven fabrics of flax, hemp and ramie	19,166	26,472	22,293	23,109

UNITED STATES PRODUCTION

(Thousands of Dollars)

	1914	1921	1923	1925
Linen thread	3,409	2,874	5,723	4,614
Linen woven goods	1,766	3,474	2,812	2,933

	1924	1925	1926
Flax, fiber and seed	74,000	50,000	39,000

The linen industry is essentially one of the old-fashioned trades, and as such, for a very long time, strongly opposed any connection with the newly invented rayons, in spite of the fact that a number of textile manufacturers of Europe had discovered the extreme usefulness of flax as warp in cloths made from rayon. It was not until about 1925 that the linen trade all over the world really awakened to the fact that they were letting something worth while slip through their fingers from sheer lack of enterprise.

It has been widely said that when a mistake is acknowledged it is well on the road to correction, and the result has been that not only at home but in other countries also the linen manufacturers have been busily engaged in research to find the best methods of weaving that will produce fine cloths that shall be worthy of the very high standard of beauty that is essential for these materials. In several European countries they have gone solidly over to the rayon mixtures, and right now the markets are beginning to be flooded with beautiful fabrics that have all the brilliance of the newer fiber combined with the sturdy

qualities of the old, especially in such as are suited for table napery and bed linen.

There has been a tendency to blame the linen manufacturers for their backwardness in accepting modern innovations and thus leaving the rayons untouched; but it should not be forgotten that they are immensely proud, and justly so, of their cloths, and the very idea of mixing it up with anything that is not a product of nature was distasteful to them; but as those mills in which tradition is not so strongly embedded have been able to get away with it, the sturdy die-hards have been forced to get into line so that they might be able to compete in the world's markets.

Flax-Rayon Mixtures

One of the chief, perhaps the most important, of all the properties of flax is its great tensile strength; its durability has been celebrated from the earliest days; it has, in addition, a beautiful luster or sheen which is not unlike that of silk. With a fiber of such quality, any mixture must seem to the craftsmen rather like "painting the lily"; but at the same time rayon also has so many excellent features that a mixing of the two serves to bring out the fine points of both instead of reducing those of either.

The majority of linen-rayon cloths are woven with a warp of tow yarn or flax linen with a viscose filling; fabrics on this general basis have found quite extensive use and complete success for tablecloths, hangings, lighter upholstery, tapestries, curtains and, in the finer counts, for easily laundered summer dresses. One special quality possessed by these latter materials is that they do not crease very readily; they are, therefore, very popular for fine weather wear.

Fabrics woven of the fibers just mentioned would be intended for solid shade dyeing, unless the two fibers had been previously dyed in the hank; but if cross-dyeing in the piece is preferred, the weft will be cellulose acetate yarn and the process such as will be described later. Another variation that so far has only begun to make its appearance on the market, though there is every indication of the demand being rapidly extended, is a mixed yarn in which linen and rayon staple fiber are mingled. The preparation of these multiple fiber yarns calls for no special machinery; the mixing may be done on the existing tow spinners when the flax has come from the hacklers. The process consists in simply doubling and drawing the staple fiber tops with the flax silver; after that the mingled silvers are just worked up to the roving frame and so to the spinners in the normal fashion.

In some parts of the United States there has been considerable progress with the rayon-linen cloths; indeed, one authority has gone so far as to state that 13% of the total rayon produced here is used with flax, though it is possible that the wish has been father to the thought in this case.

European competition in the manufacture of these mixed fabrics is a very serious matter, especially when it is remembered that the Czecho-Slovakian spinner earns about $2.50 per week, certainly never over $3.00, and he is able to rent a two-room apartment for 25 cents a week. The mills in which these folk are employed are using the finest possible machinery that can be produced by the most expert flax engineers in the world, and consequently there is little to handicap them in putting their really fine cloths on the markets of the world at prices that make the home manufacturer sit up and rub his eyes.

In addition to this, much of the finest linen yarns turned out by the highly skilled spinners of Belfast, northern Ireland, are exported in ever-increasing quantity to these parts of Europe to be woven into fabrics and sent back again. This is a well-nigh incredible example of a short-sighted business policy which is largely influenced by the question of cost of finishing. In Belgium, for instance, the charges for bleaching are 75% lower. The craving for cheapness and low cost of output is productive only of trouble and disaster; there are frequent strikes among the ill-paid linen weavers, and mills are closed down for indefinite periods. An example of this will be found in Japan, where a quite promising little linen industry had sprung up; it was already beginning to make its presence felt in the market, but has now practically faded out of existence owing to repeated strikes brought about by low rates of wages.

Research on Flax

As in the past, so in the future, quality in flax fabrics will be the deciding feature; and, in order to help, much research is being carried out with a view to improving the methods of production and making them more foolproof, in addition to lowering the cost. The work of Dr. Pritchard has every appearance of going a long way down this road, and the linen industry generally is watching the outcome of the commercial scale trials with no little interest.

As quoted in the beginning, the United States imports a very much larger amount of linen fabrics than is made at home; and though the greater part of the pure linen cloths come from the United Kingdom and the Irish Free State, much of the fancy linen—that is, the kind containing rayon—is brought in from Italy, Germany and Belgium. These fancies are, to a very great extent, occupying the favorable position that has hitherto been held by damasks. The market in Latin America for fancies to be used for dress materials is a very large one, and has not as yet been fully exploited, though it has been by no means neglected. In Australia there is a growing demand because the home-made dress industry is being fostered by the Government, while the demand from New Zealand is well worth consideration.

If the manufacturers of these mixed fabrics are to make a world-wide success of their enterprise, it will be necessary for them to take off their coats and get right to it, as those who are already in the field are finding increasing numbers of energetic competitors; there is no room for sitting down and wondering what next while the world is shouting loudly for notions and novelties. Here is the great opportunity for our best designers to show their mettle, because, as someone wisely said at a recent conference, "the originality of conception displayed is being rewarded in the volume of useful business that is being secured in America and in England."

Pure Irish linen handkerchiefs have a world-wide celebrity, but the most ardent patriot would be forced to admit that they do not show up to full advantage in appearance when exhibited alongside the rayon-linen mixtures that are being imported from Switzerland; even in Belfast itself large numbers of these Swiss goods are being offered for sale, though this will probably not continue, because a number of firms there have imported the necessary looms from Switzerland in order to be able to compete with the specially fine weaving, which is the most prominent characteristic of the goods.

Shirtings of very fine flax with effects of rayon woven, either in the plain or with designs printed on them, are having a great sale in the higher grades of men's wear; but it is for upholstery purposes, more especially in bedroom furnishings, that these mixtures, in all varieties of coloration, are having the greatest vogue. Although the fashion is not yet very widely spread, it is certainly a growing habit to have the sheets and pillow-slips dyed in a color to match the general scheme of the bedroom, and it is well worth while for the manufacturer to be aware of the modern tendency in this direction in the higher qualities of goods.

For general upholsterings, tapestries and hangings of a heavier order, coarser tow yarns are being extensively employed as warps for cloths in which the rayon appears in brocades and Jacquard effects.

The principal call for these mixed materials, however, has been, and it looks as though it will continue to be, for lighter dress fabrics, which have now, it would seem, become an established fashion for the brighter weather.

Dyeing of Rayon-Linen Fabrics

When considering the dyeing of rayon-linen fabrics, the most important point to be remembered is that the affinity of the former for the substantive colors is much greater than that of the latter; indeed, so marked is this difference that unless precautions are taken to prevent the color from rushing onto the viscose, a two-color effect will be produced. It should not be assumed that this is altogether a fault; in fact, in some dyehouses the contrary holds good and the difference is taken full advantage of when solidity of coloring is not desired. The cloths are never bleached after weaving. It is a well-known fact that very large quantities of linen are spoiled in the bleaching operations, which are of so severe a nature that the rayon would most certainly be destroyed. For this reason, therefore, both the yarns are bleached, each in its own way, before reaching the mill. In connection with this matter of bleaching, it would be interesting to obtain some comprehensive figures that would show how much of the fine linen output is sent to the paper mills to be pulped up because it has been spoiled by the bleachers.

The normal wetting-out bath for linen, consisting of a solution of 5 or 10% of caustic soda used at the boil, will be entirely out of the question, as it would quickly dissolve out all the rayon, or at least destroy the luster and convert it partially into oxy-cellulose. Instead of that drastic process, the following bath should be made up: Water, softened, 120 gallons; sodium carbonate, dry, ½ pound; sulphonated castor oil, 1½ pounds. The batch of material should be worked in this at a temperature just below the boil for preference, though it will not do any harm if it actually does boil. The time required will be at least one hour, though if the fiber flax yarn is in any way hard twisted it may take two hours properly to wet it out.

During recent years there have been placed on the market a number of special soaps which have been compounded with a view to hastening the wetting-out of textile fabrics generally. There are several of these which are also of value in this special connection, notably those that contain trichloro-ethylene, hexahydrophenol and other somewhat complicated organic compounds. A very noteworthy feature in the use of soaps of this type is that they leave the goods in a very nice condition for subsequent treatment.

In essentials the use of substantive colors for the dyeing of these fabrics does not depart from the process that is in use for cotton goods, but there are certain small modifications of detail, especially with regard to the addition of assistants, in order to insure the leveling of the shade. For a pale shade the dyestuff, which will have been stirred to a paste with hot water—softened, of course—and poured through a sieve, will be added to a kettle which contains: Sodium carbonate, dry, 0.5%; Turkey Red oil (sulphonated castor), 1%; *Glauber salt, 2%. This is a very good formula to make a start with, but if the preliminary trials suggest that color is rushing onto the viscose too quickly and leaving the linen too pale, it is as well to reduce the quantity of Glauber salt and make up the Turkey Red oil by the same amount. It is always better to work the bath up from about ordinary temperature to somewhat around the boil; this should be done slowly, occupying an hour over it, if the goods are not sufficiently well dyed before that;

everything depends upon the penetrability of the linen yarn. A moderately long bath is desirable, the proportions being between 35 and 40 to 1.

When dyeing medium or dark colors, the following should be the basic formula for the assistants: Sodium carbonate, dry, 1%; Turkey Red oil, 0.5%; *Glauber salt, 2%. Here again the same remarks apply as to the exact quantity to be used, and in this case a much shorter bath will give better results; the proportions that will be found suitable are of the order of 17 or 20 to 1. In dyeing under these circumstances, the goods are entered just below the boil and taken right up, the temperature being maintained until the desired color has been obtained. It seldom happens that the baths for deep shades are exhausted, and it is therefore necessary in the interests of economical working of the dyehouse to retain these as standing baths. In this case each succeeding batch of goods will require the addition of two-thirds to three-quarters of the original quantities of coloring matter and about 25% of the assistants. It is impossible to give a full list of all the dyestuffs that may be used successfully in this class, but those named below have the merit of being excellent for the purpose:

Erie Fast Yellow KM	Pontamine Fast Blue 6GL
Erie Fast Orange A	Pontamine Green GX
Erie Scarlet B	Pontamine Catechu GN
Erie Violet 3R	Pontamine Black RX
Erie Niagara RW	
Erie Green WT	Diamine Fast Yellow AGG
Erie Catechine 3G	Diamine Orange F
Erie Black RXOO	Diamine Scarlet RG
	Diamine Violet BB
Chlorazol Fast Yellow B	Diamine Blue RW
Chlorazol Orange R	Diamine Green B
Chlorazol Fast Scarlet 4BS	Diamine Brown 3G
Chlorazol Violet R	Diamine Milling Black FG
Chlorazol Blue RW	
Chlorazol Green BN	Chloramine Chrysophenine
Chlorazol Brown M	Chloramine Pyrazol Orange G
Chlorazol Black GF	Chloramine Red B
	Chloramine Fast Violet R
Pontamine Fast Yellow B	Chloramine Blue 3B
Pontamine Fast Orange S	Chloramine Dark Green B
Pontamine Fast Scarlet 8BS	Chloramine Brown 2R
Pontamine Violet N	Chloramine Black EX Extra

With regard to some of the blues and greens, it has been found—and the remark applies also to some of the other shades—that a somewhat improved leveling can be obtained by dyeing from a slightly acid bath instead of using the formula which has been given above. The fastness to light of the colors is good, and even in some instances it is considered better. Whether the following or the foregoing formula is adopted must depend upon a number of different factors, such as the make of dyestuff used, the make of rayon, the condition of the linen yarn, and so forth. Here is the recipe: Monopole soap, 0.5%; formic acid (85% technical), 1%.

*If practice finds desirable, somewhat larger quantities of Glauber salt may be used.

The Sulphur Dyes for Rayon-Linen Goods

Other dyestuffs which give good fast colors on mixtures of rayon with linen are the sulphur dyes, which are more especially applicable in those cases which call for colors lacking in brilliance. There is no doubt that much wider use would be made of this exceedingly valuable range of dyes if it were not for the dulness which characterizes them; although this is not a fault in many instances, there are far more in which the demand is for brightness and delicacy. It is not an altogether easy task to get a completely successful result with the sulphur colors; it is, for instance, difficult to get one batch colored up to match another without entailing a prolonged working in a strongly alkaline dye liquor at a fairly high temperature. This is, of course, very bad for the rayon part of the cloth. Leveling, also, is not automatic with these colors; it calls for considerable experience in handling before a dyer can be sure of repeating results; but once that experience has been obtained, the difficulties of manipulation are few and the results are very satisfactory. As regards fastness to light and to the influences of laundering, perspiration and rubbing, there is nothing wanting with the sulphur dyes.

When used with a linen-viscose mixture, the dyes are brought into solution by boiling up with a sufficiency of sodium sulphide; the amount of this to be used varies with the dye, but as a general rule it requires somewhere around three-quarters to one and a quarter of the weight of the dyestuff itself. When it has been dissolved, an amount of dry sodium carbonate equal to between 4 and 5% of the weight of the goods in the batch is added, together with 1% of Turkey Red oil and from 10 to 30% of Glauber salt, depending upon the depth of color required. A medium long bath is best, one in which the proportion of liquor to fabric is about 25 or 30 to 1. It is preferable to work in a kettle that has an arrangement of rolls whereby the goods may be squeezed free from dye liquor when the coloring operation is complete. The entering temperature should be 60° C., and this should be maintained during the period of working, which may range from forty-five minutes up to an hour, by which time the color should be right and the goods can be pressed through the rollers, being then thrown immediately into a bath of cold water containing a small quantity—say, about one-half of 1%—of sodium sulphide. The object of this is to dissolve away any excess of dyestuff that may be clinging to the fibers and which might lead to staining if left in contact for any length of time. It is necessary to wash the batch twice more in soft water before passing it onto the hydroextractor. The result that is obtained in this way does not give the full shade on the linen yarn, as it can be easily seen that the treatment necessary to bring that fiber up to the final color is much above that which the rayon is capable of withstanding with-

out damage. If, therefore, it is essential that the color of both fibers should match exactly, they should be dyed in the hank and woven afterward. Linen requires boiling to bring it into line, especially in medium and dark shades, and with a bath such as that mentioned here the viscose would probably lose considerably in luster, even though the newer makes would not be weakened as regards tensile strength when redried.

The following list contains some of the dyes in various makers' ranges which are suitable for this purpose:

National Yellow 2G
National Bordeaux R
National Blue G
National Indigo BG
National Green 2G
National Brown CG
National Black F

Sulfogene Carbons 2B, 8G, H, M

Thionol Yellow GR
Thionol Orange R
Thionol Purple B
Thionol Blue 2BN
Thionol Navy R
Thionol Green B
Thionol Brown O
Thionol Black OG

Immedial Yellow GG
Immedial Orange C
Immedial Prune S
Immedial Blue BN
Immedial Navy CRV
Immedial Green BB
Immedial Brown D
Immedial Black V

Thional Yellow G
Thional Orange G
Thional Blue 6BS
Thional Navy R
Thional Green 2G
Thional Brown B
Thional Black T

A few passing through a bath containing a small quantity of hydrogen peroxide is very useful for brightening some of the colors, especially the blues and greens, and aftertreatments with copper sulphate and bichromate of potash or soda is good for increasing still more the fastness to light and washing. This treatment, however, should only be resorted to when the demands for added fastness are very stringent, because there is always a marked deadening of the shade and none of these is so bright that any further dulling can be faced with equanimity. The details of the aftertreatment are as follows:

Aftertreatment

The well-washed goods are entered in the aftertreatment bath at a temperature between 70 and 80° C. and are worked for about twenty minutes or half an hour, and then very thoroughly rinsed; a few runs through a warm soap bath containing Turkey Red oil should be given in order to counteract any tendency to harshness. This also has the merit of brightening the color to a slight extent. A formula for an afterchrome is given as follows: Bichromate of soda, 2 to 3%; copper sulphate, 1 to 2%; formic acid (60%), 5%. The soaping bath is: Water, softened, 120 gallons; Marseilles soap, 10 pounds; Turkey Red oil, 0.5 gallon. The working temperature of this bath should be the same as the foregoing, about 60°.

It is by no means unusual to brighten up the goods which have been dyed with the sulphur dyestuffs by topping them off with the basic colors; although notoriously fugitive to light, they serve to give an appearance of brilliance to the fabrics when first seen. When basic dyes are used after the sulphur colors, there is no necessity for the ordinary mordanting processes to be carried out; the goods are passed right into the bath, in which the solution of dyestuff is added, in two or three parts, as the bath becomes exhausted. The initial temperature of this liquor should be that of the room, and working is continued until the desired shade is reached. In the meantime the steam is turned on, slowly raising the bath to 60 or 70° C. Between 3 and 6% of formic acid will be needed in the dye liquor.

There are some occasions in which these goods are simply dyed with the basic colors only, fastness not being essential. In such cases the fabrics must be mordanted, and the process preferred by the majority of experienced dyers is the following, which is simple in use and has stood up to favor almost from time immemorial. The first bath is. Tannin or tannic acid, 2 to 6%; hydrochloric acid, 0.5 to 1%. The goods are entered at 60° and allowed to soak for several hours, not less than two but longer if the linen yarn is tightly twisted; an earthenware or perfectly clean wooden beck is best for this. Before lifting, the batch is run over the winces several times to even up the liquor, and may then be hydroextracted, after which it passes without washing in bath No. 2, containing antimony potassium tartrate equal to half the amount of tannin used. Normally this tartar emetic bath is used cold, but in the case of linen-rayon cloths it is better to heat it up to just around 40° in order to insure the complete penetration of the flax fiber. Working should be continued for thirty minutes or so, after which there follow extraction and a good rinsing, being sure to remove the last traces of acid.

The following list of dyestuffs contains the names of some that have been found eminently suited to these mixtures, but it does not pretend to include all that may be successfully employed:

Acronol Yellow T
Aniline Yellow
Tannoflavine T
Phosphine GN
Chrysoidine GN
Auramine O
Tannin Orange GG
Saba Phosphine RR
Safranine 6B
Rhodamine B
Rosazeine 6G
Tannin Pink C
Methylene Blues
Acetinduline
Victoria Blues
Methyl Violets
Tannin Helio
Malachite Greens
Solid Green O
Methylene Green G
Brilliant Green B
Victoria Green (small crystals)

Another class of dyestuffs that has been introduced largely to cope with the difficulties of dyeing these particular mixtures of fibers is that known as the soledon colors. This range belongs to the developed dyes, and the method of dyeing presents very few obstacles to the dyer who has had some experience in

the handling of the colors belonging to this class which appear on the lists of the older makers.

Dyeing with the Soledons

The soledon dyes exhaust more readily from a short bath than a long one; and though the actual proportion used will vary according to the type of vessel in which the operation is being carried, it is some guide to know that when the work is being done in a jig the bath may be cut down to between 9 and 10 to 1. The colors are purchased in the form of paste, which is stirred up with hot water and washed through a sieve into the soft water in the beck, in which 20% of Glauber salt has been dissolved. Steam is turned on, and when the thermometer reaches 60° the goods are entered and kept running for thirty minutes, the temperature being raised to 80° during that time. Working is continued for an equal length of time while that temperature is kept up, and then the cloth is taken out and the excess of liquor pressed from it.

The final color is developed in three stages, of which No. 1 consists in plunging the batch for one minute only in a cold bath containing sodium nitrite to the extent of 1% of the dry weight of the goods. Being then taken out and squeezed again, they pass to the second stage, which calls for a plunge in a cold bath containing 1% of either sulphuric or hydrochloric acid. On being lifted from this, a good rinsing is needed to free the fibers from acid, and when this is done they go to the third bath: Marseilles soap, 10 pounds; sodium perborate, 5 pounds; water, softened, 120 gallons. This liquor is used cold and the cloth is just run through two or three times, being then washed and dried up.

The process may be shortened by one handling if the two first stages of the development are cut out and either of the following baths substituted; the final treatment in either case will be that given as the third bath, above:

(1) Plunge the goods for a couple of minutes in a bath containing 1% of ferric chloride slightly acidified with hydrochloric acid; or

(2) Plunge for a couple of minutes into a bath containing 1% of sodium persulphate slightly acidified with sulphuric acid.

In the course of the preliminary dyeing it will be noted that a much deeper and fuller shade may be produced without using any additional dyestuff if an extra quantity of Glauber salt is put in and the bath is taken up to the boil. There is no reduction of brightness when the extra Glauber is put in, but if only the temperature were raised without making the addition there would be some little danger of blinding the fabric. Although the method just described covers the whole range of the soledon dyes, there are one or two slight modifications which are advisable in the use of certain members of the class; these may be ascertained from the makers, and though they are not in any way difficult or toilsome they certainly do add slightly to the already high qualities of the colors. The alteration may be a slight raising or reduction of the temperature, or an additional treatment during development in a bath of copper sulphate containing either 0.5% or 1% of the salt at 75°. This applies only to the Black and is used to give a rich, bloomy shade to it.

This range of colors includes the following:

Soledon Yellow G	Soledon Jade Green
Soledon Brilliant Purple RR	Soledon Black 2B
Soledon Dark Blue B	

There is another make of somewhat similar dyes which are probably excellent, but the writer has not yet carried out any work with them; their omission, therefore, implies nothing whatever against them.

Use of Acetate Rayon in Mixtures with Flax

The fibers made from regenerated cellulose, in either of the three principal forms in which it is at present appearing on the textile markets, are not the only rayons that may be used in connection with linen mixtures. As already mentioned, there have been a number of successful experiments done with a mixture containing cellulose acetate, and these have in some cases passed beyond that stage and have been made commercially; the beauty of their appearance has created something of a stir.

It is the general practice to weave this type of fabric from yarns that have been dyed in the hank, owing to the well-known delicacy of the acetate fiber when subjected to prolonged treatment such as is required when getting full or even medium shades on linen. Not only will the luster be diminished more readily than is the case with the regenerated cellulose fibers, but the strength also suffers more, as this form of rayon is decidedly weaker as regards tensile strength than are the others. It is for this reason that the fiber flax is colored in accordance with one or another of the standard methods of dyeing, the acetyl yarn being dyed with one of those classes of coloring matters that have been brought out especially to overcome the difficulties that arose in the early days when the ordinary dyestuffs were found to be unsuitable.

It is possible, however, to obtain quite good solid effects and also cross-dyeings on acetyl-linen fabrics in the piece, and below will be found the details for this method of dyeing in which the dyes used belong to the Caledon and Celatene classes of colors, which have been newly placed at the disposal of the dyeing trade.

The first stage of the work is the dyeing of the linen, which is performed by means of a vat dye that can be used cold or as nearly so as may be possible. There are vat colors which are generally worked at mod-

(*Continued on page* 368)

WINTER DAMAGE IN LAUNDRIES

IN a talk before the Massachusetts Laundryowners' Association at Boston, Mass., on April 6, J. J. Wilkie, of the Bureau of Standards, outlined the progress of the work at the bureau on "winter damage." A report on this work will be published later in the year when the experimental studies now under way have been completed.

The "winter-damage" problem has attracted considerable attention for six or eight years and four theories of the cause of the damage have been advanced. They are: 1, Sulphur dioxide theory (fume smoke); 2, chemical theory (catalysis in bleach bath); 3, bacteria theory, and 4, combination of above given theories. No evidence in support of any theory has been conclusive and the laundrymen have not known how to prevent the damage. At the request of the Laundryowners' National Association in 1927, the bureau undertook to determine facts which might lead to a solution of the "winter-damage" problem.

Since the damage occurs chiefly in the New England district, field work has been carried out in several laundries near Boston. The fact that the damage is found only in wet wash, which is returned to the customer to be dried and ironed, led to a comparison of the effect of home finishing with laundry finishing. It was found that the breaking strength of towels which were repeatedly washed, dried outdoors, and ironed by hand decreased faster than the breaking strength of similar towels washed at the same time and finished in the laundry. That this deterioration may be attributable in part, at least, to atmospheric sulphur dioxide was shown by exposing damp towels to air containing 1 part per 1,000,000 of sulphur dioxide, ironing, moistening the towels, and repeating the treatment. Towels processed in this way decreased in strength at about the same rate as towels which were washed in the laundry, hung outdoors, and dried.

Towels containing small amounts of iron deteriorated much faster than towels containing no iron. Very small amounts of chlorates, or of soap mixed with sodium hypochlorite, such as might remain in the goods from the laundry, also promoted deterioration of towels when exposed to air containing sulphur dioxide.

It was observed that "winter damage" was prevalent in laundries using satisfactory washing procedures. However, traces of active chlorine were sometimes found in the final rinse in these laundries. The rinse water sometimes contained iron (red water) during the day as well as in the morning, and chlorine gas was sometimes evident in the atmosphere of wash rooms which were improperly ventilated during cold weather. The experiments referred to above indicate that iron and chlorine may play a part in "winter damage" and should be avoided as far as possible.

Chemical analyses of many damaged articles have been made. They show that sulphuric acid is practically always present in cases of typical "winter damage." Iron or other oxidizing agents usually are present. It was found that during typical "winter-damage" weather, overcast days in the winter time, wet towels took up sulphur dioxide when exposed in ordinary city air in Washington, D. C., and became acid in reaction. This did not occur on clear, dry days, but often did occur when the towels were hung out overnight.

Similar results were obtained in New England. This may be more likely to occur in New England because New England water is deficient in the buffer salts present in water in other parts of the country. Sulphur dioxide in cloth is readily oxidized as sulphuric acid, which is injurious, especially when heated, as when the wash is ironed.

In order to prevent goods from becoming harmfully acid when hung outdoors during winter, a special alkaline treatment was devised. Calcium bicarbonate is formed in the final rinse by the action of sodium bicarbonate and calcium chloride. A small amount of calcium bicarbonate remains in the cloth when it is dried. This process has been used during the past winter in two New England laundries. A material decrease in the amount of "winter damage" has resulted.—*Bureau of Standards, Technical News Bulletin.*

NEW PROCESS SPEEDS PRINTING ROLLER PRODUCTION

One of the most common handicaps to fast work in the textile printing mill is the delay that must be endured whenever printing rolls are sent out for a new set of designs. A recent invention shortens the time needed to etch new patterns on rolls, it is claimed, so that by means of the process it is possible to prepare rollers for a six or eight color pattern in three to four days.

The new method, described in recent reports as the Cylindrotex method, is based on the preparation of a zinc plate with the desired pattern, and the transferring of this drawing by means of a cross-printing method to a copper roller, which is then suitably covered with lacquer and etched.

One particular feature of the method that is obviously of value to the printer, according to the description of the process, is that the repetition work of the machine is identical with previous processing to within one-fortieth of a millimeter without any manual labor intervening.

The Cylindrotex process is also capable of being used for other purposes, notably for special patterns and designs such as ombrees, etc., which may be produced by means of special methods devised by the Cylindrotex Company, of Basle, Switzerland.

DYE IMPORT TOTAL EXCEEDS THAT FOR 1928

Figures for First Four Months Higher in Value and Pounds

LAST week the monthly statistics on imports of dyes and other synthetic organic chemicals for April were announced by the Department of Commerce and the United States Tariff Commission. According to these figures the total imports of coal tar dyes for the first four months of this year is somewhat higher than the total for the same period of last year. The actual figures appear below. During the month of April, 576,193 pounds were imported, with an invoice value of $445,200. Imports by ports were as follows: New York, 573,023 pounds, valued at $440,693; Boston, 2,600 pounds, valued at $3,225; Philadelphia, 570 pounds, valued at $1,282.

The table showing imports for this year is as follows:

Imports of Synthetic Dyes (Four Months)

	1929		1928	
	Pounds	Invoice Value	Pounds	Invoice Value
January ..	552,821	$432,505	415,156	$327,148
February ..	390,664	323,514	478,407	391,351
March	766,786	612,253	378,191	316,183
April	576,193	445,200	633,815	505,152
Total ...	2,286,464	$1,813,472	1,905,569	$1,539,834

Per Cent of Dyes by Country of Shipment

	April, 1929	April, 1928	Jan.-Apr., 1929	Jan.-Apr., 1928
Germany ...	71	75.0	72.30	62.56
Switzerland .	24	15.0	23.15	25.76
France	2	2.0	1.17	1.79
England	1	2.0	1.14	2.27
Belgium	1	2.5	.77	2.90
Canada	1	1.0	1.07	2.40
Italy	..	2.0	.21	1.95
Netherlands .	..	0.5	.19	0.37

Dye Imports by Ports

	Pounds	Invoice Value
New York	573,023	$440,693
Philadelphia	570	1,282
Boston	2,600	3,225
Total	576,193	$445,200

Leading Dyes, by Quantity, Imported During April

	Pounds
Vat Golden Yellow KG double paste for printing (S. S.)	32,000
Algol Yellow GC paste, double paste (S. S.).	19,502
Brilliant Indigo 4B paste, 4B pdr. (S. S.)....	14,687
Vat Black BB pdr. (S. S.)	14,286
Algol Scarlet GGN paste for printing.....	14,000

Remaining in Bonded Customs Warehouse

	Dyes and Colors Pounds	Intermediates Pounds
August 31, 1928	707,820	2,584,244
September 30, 1928 ...	707,609	2,508,765
October 31, 1928	622,489	2,722,532
November 30, 1928....	410,501	2,497,336
December 31, 1928....	716,811	2,561,336
January 31, 1929.....	513,231	2,598,317
February 28, 1929	541,002	2,276,018

Imports of Color-Lakes

	Pounds	Invoice Value
January	875	$679
February	....	....
March	3,907	1,709
April	2,469	2,354
Total	7,251	4,742

FALL AND WINTER SHOE COLORS ANNOUNCED

Co-operating with the Allied Shoe and Leather Industries, the Textile Color Card Association has selected fourteen special shades for evening shoes. These have been chosen to match or contrast with the fashionable shades in evening gowns and will be widely promoted for fall and winter by the Allied Shoe and Leather Industries.

Prominent among the new shoe colors are three bright jewel tones: Persian Torquoise, Jade Green and Venetian Coral. Jaune d'Or is a yellow with a golden tinge. Bleu Celeste is a sky blue, and Rose France is the pink of the flower of that name. Banana Heart is a soft pinkish green tone, while Homard is an animated light red. Violetta is the tone of Spanish Violets, and Blue Violet is a soft shade in the prevenke family with a more decided cast.

The other colors in the shoe card are: Pale Capucine, Golden Capucine, Brilliant Capucine and Grande Chartreuse, which are taken from the 1929 Supplementary Summer Card.

GENERAL DYESTUFF, OF PROVIDENCE, MOVES

After June 1 the office, laboratory and warehouse of the Providence branch of the General Dyestuff Corporation will be located at 85 Tockwotton Street, Fox Point, Providence, R. I. The telephone numbers remain Gaspee 1585-1586-1587.

Proceedings of the American Association of Textile Chemists and Colorists

The American Association of Textile Chemists and Colorists

President
E. H. KILLHEFFER
Newport Chemical Works, Passaic, N. J.

Vice-Presidents
WALTER S. WILLIAMS—P. J. WOOD

Secretary
ALEX MORRISON
American Woolen Co., Andover, Mass.

Treasurer
WINTHROP C. DURFEE
516 Atlantic Avenue, Boston, Mass

Councilors
RALPH F. CULVER — GEORGE A. MORAN
B. F. PHETTEPLACE — HUGH CHRISTISON
WILLIAM R. MOORHOUSE — WALTER M. SCOTT

Past President and Chairman of the Research Committee
LOUIS A. OLNEY
Lowell Textile Institute, Lowell, Mass.

LOCAL SECTIONS AND THEIR OFFICERS

Northern New England Section—
William H. Cady, Chairman, Pacific Mills, Lawrence, Mass.
Harold C. Chapin, Secretary, Lowell Textile Institute, Lowell, Mass

Rhode Island Section—
Richard B. Earle, United States Finishing Company, 389 Charles Street, Providence, R. I.
A. Newton Graves, Secretary, Franklin Process Co., Providence, R. I

New York Section—
Daniel P. Knowland, Chairman, Geigy Company, N. Y. City.
Philip H. Stott, Secretary, Newport Chemical Works, Inc., Passaic, N. J.

Philadelphia Section—
A. M. Burt, Chairman, 1046 Public Ledger Building, Philadelphia, Pa.
Percival Theel, Secretary, Philadelphia Textile School, Philadelphia, Pa.

Piedmont Section—
Prof. Chas. E. Mullin, Chairman, Clemson College, Clemson, S. C.
Thomas J. Nuckolls, Secretary, Renfrew Plant, Brandon Corporation, Travellers Rest, S. C.

South-Central Section—
L. L. Bamberger, Chairman, 201 College Street, Cedartown, Ga
I. V. Sheffield, Secretary, United States Finishing Company, Cedartown, Ga.

Midwest Section—
Carl E. Bick, Chairman, Real Silk Hosiery Mills, Indianapolis, Ind.
Clarence Wille, Secretary, Burson Knitting Company, Rockford, Ill.

Lowell Textile Junior Section—
A. Kempton Haynes, Chairman; Walter C. Lindsly, Secretary

APRIL MEETING OF THE NORTHERN NEW ENGLAND SECTION

THE Northern New England Section met at Riverbank Court, Cambridge, on April 6. Over fifty were present. Dr. Carl Z. Draves, of the Du Pont Company, spoke on "The Dyeing of Ponsol Blue BCS," and Harold W. Leitch led discussion of "Piece Dye Kettles." Dr. Draves's paper and discussion are published below.

HAROLD C. CHAPIN, *Secretary.*

The Dyeing of Ponsol Blue BCS

By DR. CARL Z. DRAVES
E. I. du Pont de Nemours Company

IN a book dealing with the dyeing of vat colors the statement is made that "The different quantities of caustic soda and salt necessary for dissolving the dyestuffs, also the temperatures to be observed during the dyeing, are the only distinguishing features of"—the Indanthrene dyes. In other words, the attempt is made to separate all the vat dyestuffs into three general groups as far as application is concerned even though the products within each group may differ from each other considerably in ease of reduction, stability, solubility and other properties. But appreciating that each and every vat dyestuff possesses individual characteristics as far as dyeing properties are concerned, we plan to develop recipes peculiarly adapted to each product. Therefore an intensive study has been made of the best conditions suitable for the dyeing of some of our vat dyes.

The first color we have chosen for this work is Ponsol Blue BCS Double Paste. With the demand of the cotton finishers for dyestuffs with which they can meet the fastness requirements of the "Nafal Label" the dyeing of Ponsol Blue BCS and chemically similar competing products becomes very important because the BCS type is the only type of blue dye which possesses the necessary fastness in both heavy and light shades. Furthermore, even Blue BCS exhibits its maximum fastness only when applied under the proper conditions.

In order to gain a better understanding, not only of the properties of Ponsol Blue BCS, in particular, but also of the dyeing of the anthraquinone vat blues in general, let us consider the chemistry of this dyestuff. Ponsol Blue BCS is trichloro-N-dihydro-1:2:1':2' an-

thraquinone-azine, or more simply, trichloro-indanthrene. Since the position of the chlorine atoms is rather uncertain we give the formula of the parent substance, indanthrene (see formula I of the diagram), discovered by René Bohn in 1901.

The formulas of the various oxidation and reduction products of the halogenated Indanthrene Blues have not been completely worked out. However, since the properties of the chlorinated derivatives differ only in degree from those of the simple indanthrene we shall use the formulas for the substances derived from indanthrene to illustrate by analogy what happens to Ponsol Blue BCS when it is oxidized or reduced. We are enabled to gain a picture of these changes from a theoretical point of view because of the brilliant researches of Professor Scholl and his students upon the properties of indanthrene undertaken shortly after the epoch-making discovery of René Bohn.

When the blue-colored pigment, indanthrene (our Ponsol Blue RS Paste), is treated with sodium hypochlorite it is changed to the green-colored substance called the azhydrine (formula II). Among the halogenated derivatives, such as our Ponsol Blue GD and BCS, the greater the halogen content the less readily does this change take place. Since the dye may pass through the same transformation when it is on the fiber we can understand why, although BCS is much faster toward hypochlorite bleach than GD, even BCS will turn green if the bleach solution is strong enough. Further, we can also understand why BCS does not stand up under the hypochlorite bleach test the way it should when it is dyed at such high temperatures that the chlorine content of the dye molecule is decreased.

The azhydrine, or green form, is very readily reduced back to the dihydroazine, or more stable blue form, by any mild reducing agent. Sodium bisulphite, sodium thiosulphate, sodium hydrosulphite, glucose and many other substances will effectually "spring back" dyeings of blue made green by bleaching. Even the cellulose of the cotton fiber in the presence of light is capable of this reduction.

A more vigorous oxidizing agent such as nitric acid oxidizes indanthrene to a yellow substance called anthraquinone-azine (see formula III of diagram). Blue BCS also forms the yellow azine in an exactly analogous manner. This experiment can be very easily tried. Dissolve a little Ponsol Blue BCS in concentrated sulphuric acid, add some nitric acid or sodium nitrate and in a few moments drown in an excess of cold water. The yellow azine precipitates. The yellow precipitated azine is easily reduced by a little bisulphite or hydrosulphite to the green azhydrine and finally by an excess of reducing agent to the original blue dihydroazine.

Bohn's Discoveries

Not only did Bohn discover the blue pigment, indanthrene, but he also discovered that a combination of caustic soda and sodium hydrosulphite renders the pigment soluble in such a way that it has a marked affinity for the cotton fiber. When indanthrene is dissolved by a caustic soda and hydrosulphite mixture it vats to form a clear blue solution of the sodium salt of anthrahydroquinone-N-dihydro-anthraquinone-azine (see formula IV of diagram).

It will be observed from the formula that only one pair of carbonyl oxygens has been reduced in this blue leuco compound to form hydroxyl groups. It is a blue solution of this leuco derivative which is ordinarily encountered in dyeing.

Ponsol Blue BCS likewise forms the analogous blue leuco-solution when properly vatted. However, and this is of very great importance in the whole subject of vat dyeing, of all the vat dyestuffs we know perhaps none requires higher concentrations of hydro and caustic for vatting than does Blue BCS. In other words, it is probable that the concentrations of sodium hydrosulphite and caustic alkali found best in this research for Ponsol Blue BCS are adequate for any color and need never be exceeded.

It seems to be a general rule that the greater the halogen content of a quinone the more difficult it is to reduce. For example, it has been found by physical chemists that tetrachlora-benzoquinone (chloranil) and its hydroquinone possess a higher oxidation-reduction potential than the simpler benzoquinone and benzohydroquinone combination. It would prove very interesting if it were possible to determine the oxidation-reduction potential of all vat dyes. If such knowledge was available it should be possible to predict at once what concentrations of hydro and caustic should be used for each vat dyestuff. However, it may be some time before such work is even attempted.

If powdered zinc is added to an alkaline vat of indanthrene or if the vat is allowed to stand for a long time above 145° F., the blue leuco form is reduced further to the brown tetra-hydroxy compound shown by formula V of the diagram. When exposed to the air both the blue dihydroxy and the brown tetrahydroxy leuco compounds readily oxidize back to the original quinone, or blue form which constitutes the usual finished dyeing.

When indanthrene is reduced with caustic soda and hydrosulphite on a boiling water bath it first forms

Proceedings of the American Association of Textile Chemists and Colorists

the blue and then the brown vats we have already described. The brown vat finally changes to a greenish blue solution of the sodium salt of N-dihydro-anthrahydroquinone-anthranolazine (VI). This green solution rather easily forms a brown residue of the sodium salt. The analogous BCS substance may sometimes be observed in the bottom of a vessel in which a rather high concentration has been held reduced for a long time at a temperature above 145° F.

The free acid, which is also brown, oxidizes in air to the reddish brown N-dihydro-anthraquinone-anthranol-azine (VII). An alkaline solution of the latter compound is oxidized in air to the corresponding azine (VIII). The sodium salt of the azine is green and the free acid is a brownish red. Sodium hypochlorite brings about the oxidation of the dihydro-azine of the anthranol we have considered to the azine in the same manner as does the combination of air and sodium hydroxide.

The Brown Anthranols

When Blue BCS is reduced and dyed at above 190° F., a brown dyeing is obtained consisting of the anthranols we have described. At temperatures above 150° F. a greater or lesser proportion of anthranol is formed depending upon the temperature, the concentrations of hydro and caustic and the duration of the reducing and dyeing periods. The result is that dyeings made at high temperatures are very dull, indeed, and in extreme cases even brown. The brown anthranols are so very stable that they can be oxidized to the yellow anthraquinone-azine only by such a strong oxidizing agent as a rather concentrated solution of chromic acid. The original blue can be regenerated from the yellow azine by springing back with hydrosulphite. However, all this is of no value to the dyer in recovering dull brownish dyeings because the strong oxidizing agent necessary for the oxidation of the anthranol would destroy the cotton fiber.

When Ponsol Blue BCS is dyed, the greenness of the shade can be slightly controlled by the temperature of application and by the severity of the soaping operation. The higher the temperature above 110° F. employed for reducing and dyeing, and the longer the vat is held in the reduced state before dyeing, the greener will be the hue of the blue obtained for a certain standard amount of soaping. On the other hand soaping reddens the shade of the Indanthrene Blues. It often requires a half-hour at the boil with 2 per cent soap on the weight of the fiber before the end-point is reached in the reddening caused by soaping.

We believe we have an adequate explanation of why Ponsol Blue BCS undergoes the changes of shade described in the previous paragraph. Since the fastness of the dyeing, especially the fastness toward chlorine bleach, is bound up with this change in shade, it is of paramount importance in this day of fast colors.

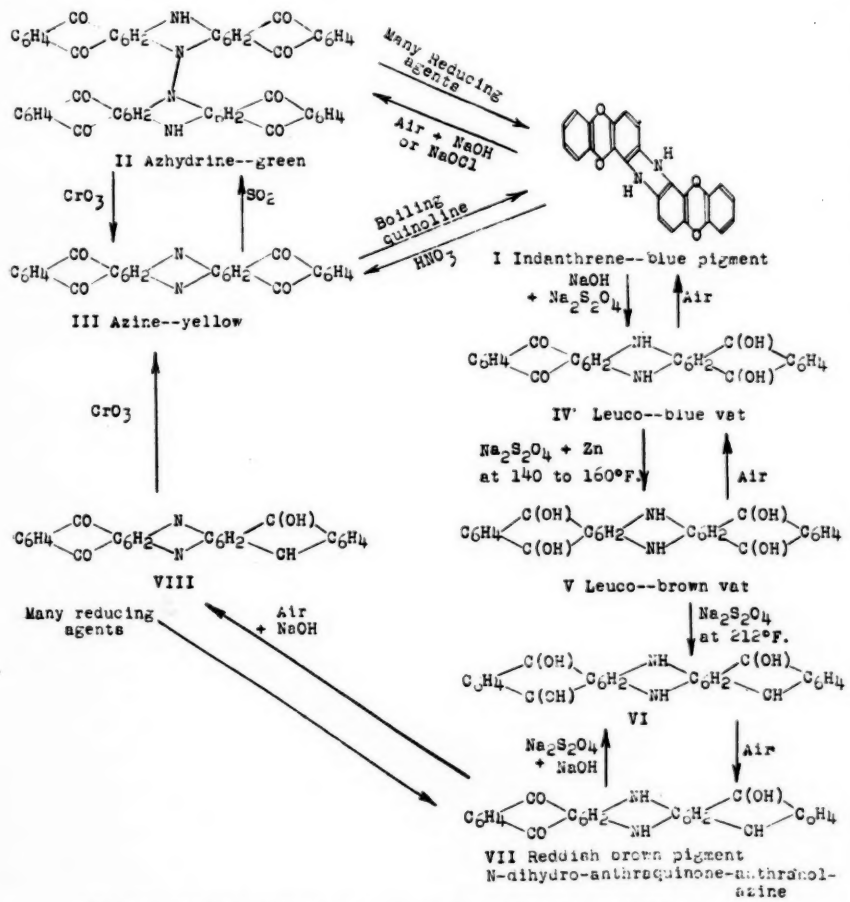

Diagram adapted from that given in "Das Anthracen und die Anthrachinone" by J. Houben und W. Fischer. Published by Geo. Thieme, Leipzig, 1929.

Oxidation and Reduction of Indanthrene

Undoubtedy the greening of BCS dyeings obtained by raising the temperature of application is due to the formation of a slight amount of green azhydrine after removal from the dye bath. The green azhydrine, as we have previously explained, is the substance which is most easily prepared by oxidation of the blue with hypochlorite. The reddening of the shade produced by soaping is due to a reduction of the slight amount of azhydrine back to the blue N-dihydro-azine.

An idea seems prevalent in many places that soaping is necessary to complete the oxidation of the Indanthrene Blues. But the real truth of the situation is that the soaping operation reduces the blues back from a condition of over-oxidation.

Formation of Green Azhydrine

One will ask at once how the green azhydrine which is best produced by such a strong oxidizing agent as sodium hypochlorite can possibly be formed by air oxidation after a dyeing is removed from a hydrosulphite caustic soda bath. When the cotton material is removed from the dye vat the hydrosulphite is oxidized very quickly because of the extremely free access of air. After the complete oxidation of the hydrosulphite the leuco compound is oxidized to the final blue and at the same time the caustic alkali still remaining on the fiber enables the air to oxidize a slight amount of color to the azhydrine in the same manner that Scholl has shown N-dihydro-anthraquinone-anthranolazine in bulk can be oxidized by air in the presence of sodium hydroxide to the anthraquinone-anthranolazine. (See formula VIII of diagram.)

If what we have said is true, greenish dyeings of BCS obtained by raising the temperature of application ought to be reducible to as red a shade as those obtained at lower temperatures. Strange as it may seem, it is indeed possible to accomplish this very thing, provided the soaping is continued long enough.

The fastness of Blue BCS toward this greening action of air and caustic soda in the presence of moisture is really identical with its fastness toward chlorine. Both fastness properties are dependent upon the power of the blue colored N-dihydro-azine to resist oxidation to the green azhydrine. In fact, it is possible to accurately predict the relative chlorine fastness of two dyeings made with the same lot of BCS and allowed to dry without soaping or souring by comparing the greenness of the resulting blue shades. The greener dyeing will always be found less fast to chlorine. BCS when properly applied possesses very little tendency to form the green azhydrine under the ordinary conditions found in practice.

In order to emphasize the relationship which exists between fastness toward bleaching and fastness toward air and alkali, it may be pointed out that Ponsol Blue GD, a monochlor indanthrene which is not so fast to bleach as BCS, greens considerably more than BCS when dyeings of the two are dipped in a dilute solution of sodium hydroxide and dried under like conditions in air. Ponsol Blue RS, a dyestuff containing no chlorine at all, greens even more than the GD. However, dyeings of the RS and GD as ordinarily prepared are not greener than those of BCS because, although the two former green more easily after removal from the dye bath, they soap back just as much more easily to the normal reddish blue shade.

Practical use may be made of this information in the continuous dyeing of long chain warps or piece goods with any of the Indanthrene Blues. If difficulty is encountered because the first and last ends, upon standing before soaping, come out different shades and the difference persists even through the soaping operation, the unevenness of shade can be entirely eliminated simply by giving a rinse or slight souring immediately after dyeing to remove most of the caustic alkali left in the goods.

A mixture of sodium hydroxide and sodium hydrosulphite, as we have already explained, possesses the property of changing the pigment form of a vat dye into the soluble leuco compound possessing affinity for the fiber. Since there is considerable variation among different dyeing recipes with regard to the ratio of caustic soda to sodium hydrosulphite employed at different concentrations, we have tried to work out general principles in the use of these reagents which might serve as a guide in all vat dyeing. Theoretical consideration of the problem, pH determinations of caustic and hydrosulphite mixtures and experience with different combinations of these reagents for long and short reduction of both hot and cold dyeing colors have enabled us to formulate very simple rules for choosing the proper amount of sodium hydrosulphite to be used with a given amount of caustic soda.

When sodium hydrosulphite acts as a reducing agent the hydrosulphite itself is oxidized to sodium bisulphite according to the following equation:

$$Na_2S_2O_4 + O + H_2O \rightarrow 2NaHSO_3$$

Since an alkaline medium is necessary to keep the leuco acid of the dye in solution as the alkali salt, it is apparent that two molecular weights of caustic alkali are necessary, as shown by the equation below, to form the normal salt from the acid sulphite produced by complete oxidation of all the hydrosulphite:

$$2NaOH + 2NaHSO_3 \rightarrow 2Na_2SO_3 + H_2O$$

In other words, in order to provide sufficient alkali to keep the bath nearly up to its original alkaline intensity, or pH, even after nearly all the hydrosulphite has been

oxidized to bisulphite, one must use at least 80 parts of caustic soda for 174 parts of pure sodium hydrosulphite. However, since even fresh concentrated hydrosulphite contains only approximately 85% of the pure substance, the remainder consisting principally of salt accompanied by small amounts of soda ash, sodium sulphate and sodium sulphite, the ratio of hydrosulphite to caustic soda must be corrected from 174/80 to 148/80 or 1.79.

Ratio of Hydrosulphite to Caustic

Sodium sulphite, the salt formed by the oxidation of the hydrosulphite according to the equation above, is hydrolyzed considerably in aqueous solution. Furthermore, the hydrosulphite is not all used up under ordinary conditions of working. Because of these facts a vat containing sodium hydrosulphite and sodium hydroxide in the ratio of 1.79 parts of the first to one part of the second should remain quite alkaline even after several days' exposure to air oxidation.

In order to arrive at a proper value for the ratio of hydrosulphite to caustic experimentally, preliminary work has been carried out on the pH, or active alkalinity, of combinations of fresh 86% hydrosulphite and pure caustic soda. Determinations have been made of the pH of two series of mixtures. The first series contained ¾ ounce of carbonate free sodium hydroxide per gallon, or the concentration one employs for dilute solutions. The second series contained 2 ounces of caustic soda per gallon, or approximately the amount we recommend for vatting 4 ounces of Ponsol Blue BCS Double Paste per gallon.

It might be explained that we do not show pH values of dye vats themselves because of the experimental difficulties encountered. After repeated trials we were forced to the conclusion that pH determinations cannot be made in the presence of the Indanthrene Blues. For some reason or other the blues poison the hydrogen electrode. It is even somewhat difficult to obtain unquestionable values for caustic and hydro mixtures alone. Perhaps the trace of sulphide in the hydrosulphite interferes. However, each value determined by use of the hydrogen electrode has been approximately checked with indicator solutions.

The results of the pH determinations are given in Table I, the values in the fourth column having been determined at once, and those of the last column the next day after oxidation to sulphite was nearly complete.

A consideration of the data in the table brings out certain facts in a striking manner. The initial hydroxyl-ion activity as measured by pH, that is the effective alkalinity, of caustic soda and hydrosulphite mixtures varies only slightly for a given concentration of alkali with even a twelvefold variation in hydro concentration. The initial alkalinity is determined primarily by the concentration of sodium hydroxide.

After standing open to the air for twenty-four hours with occasional stirring until most of the hydrosulphite has disappeared by oxidation the alkalinity for different amounts of hydrosulphite and a fixed amount of caustic is not so nearly constant as it is upon first mixing. However, it remains essentially the same for ratios of hydro to caustic of less than 2.0. When the amount of hydrosulphite becomes great enough that the ratio of hydro to caustic is more than 2.0 the dye bath will eventually become neutral or acid. We have here an explanation of why occasionally the color suddenly drops out of solution from a vat which was apparently in very good condition.

From the viewpoint of the dyer that ratio of hydro to caustic is best which gives the brightest and strongest dyeings under all conditions. In numberless experiments with both cold and hot dyeing colors for both high and low concentrations and for both short and long periods of reduction we invariably obtained the best dyeings when the ratio of hydro to caustic was about 1 to 2/3.

A Rule for the Use of Alkali and Hydrosulphite

As a result of all this work we believe we have a very simple rule for the use of caustic alkali and hydrosulphite which will serve as a guide in the dyeing of vat colors on cotton under all conditions. The ratio of the weight of sodium hydrosulphite to caustic soda used in the dye bath should never exceed one to two-thirds under any circumstances. A slightly lower figure is given for the maximum value of the ratio to be employed than the 1.79 called for by the theory in

TABLE I

Caustic Soda and Hydrosulphite—pH Determinations

NaOH Oz. per Gal.	$Na_2S_2O_4$ Oz. per Gal.	Ratio $Na_2S_2O_4$ / NaOH	pH At Once	pH After 24 Hours in Air
.75	.25	.33	11.93	.....
.75	.50	.67	11.89	11.76
.75	.75	1.00	11.88	11.70
.75	1.00	1.33	11.85	11.62
.75	1.25	1.67	11.84	11.35
.75	1.50	2.00	11.83	11.12
.75	2.00	2.67	11.81	7.50
.75	3.00	4.00	11.78	5.45
2.00	1.00	.50	12.23	12.20
2.00	2.00	1.00	12.21	12.13
2.00	3.50	1.75	12.18	11.94
2.00	4.00	2.00	12.18	11.70
2.00	6.00	3.00	12.14	6 60
2.00	8.00	4.00	12.12	5.60

order to be slightly on the safe side and to prevent the probability of using too much hydro in the event there has been a slight over-estimation of the strength of the caustic soda solution on the part of the dyer. The use of this ratio provides for the maximum reducing capacity with which nearly the same alkalinity can be maintained even after all the hydrosulphite has been oxidized. When potassium hydroxide is substituted for caustic soda, the amount of the former should be increased to 1.4 times the amount of caustic soda called for by the recipe.

In finding the conditions which yield the best results in dyeing Ponsol Blue BCS Double Paste, we have followed the usual procedure in such matters by studying the effect of variations in temperature and concentration on pot dyeings of skeins and small pieces. Conclusions were then verified by large-scale operation in the mill.

In order to submit the color to conditions it must sometimes meet in practice, vats have been held in the reduced condition as long as five hours before dyeing was started. Dyeing after a short period of reduction often gives no indication of the shade and fastness which will be obtained after a long reduction.

The laboratory technique employed for measuring both the exhausting rate and the stability of vats may be very briefly described. It comprises dyeing six skeins successively for stated intervals in the same bath. For example, a 10-gram skein is entered into 400 c.c. of dye liquor, it is turned eight times and then it is turned once again after one and one-half minutes and again after three and one-half minutes. At the end of exactly five minutes it is removed and the excess liquor is wrung back into the dye pot by twisting between glass rods. The pot is left standing empty five minutes, and then the process is repeated with a second skein. A total of six skeins is usually sufficient to measure both the exhausting rates and the condition of the bath. By staggering the entering of the skeins and their removal at minute intervals with a stop-clock, very comparative results can be obtained by one operator with five pots at once.

Only a mere mention need be made of how carefully temperatures and concentrations have been controlled in the dyeing experiments. All volumes for reducing and dyeing have been made up by exact measurement. The strength of the alkali solutions employed has been checked by titration. In dealing with Ponsol Blue BCS, temperatures must be very closely followed, since a 10-degree difference in dyeing temperature causes more difference in chlorine fastness and solubility of the leuco for a given sample than ever exists between different manufactured lots.

Concentrations for Best Results

In Table II are given the concentrations of sodium hydrosulphite and caustic alkali which have been found to give the best results for the vatting and dyeing of Ponsol Blue BCS Double Paste. For the dyeing of BCS at concentrations of less than 2 ounces per gallon it is necessary to vat the color first in a short or concentrated bath. There are two methods of doing this. One method is to make a first solution of just one-half the final volume desired, but containing all the color, hydrosulphite and sodium hydroxide which are necessary for dyeing after dilution according to the table. After allowing about fifteen minutes for reduction at 110 to 115° F., the concentrated vat is diluted with an equal volume of water at the same temperature. The oft-repeated direction of treating the water used for dilution with a small amount of hydrosulphite is quite an unnecessary precaution, providing the concentrated vat contains enough hydrosulphite in the first place.

The other method of reducing in short volume consists of reducing the dyestuff at a concentration of color paste of 2 ounces or more per gallon of the concentrated liquor and of using the amounts of hydrosulphite and caustic alkali given in the table for that concentration of color paste. Then, after fifteen minutes reduction, this stock vat is poured into water at the proper temperature containing enough hydrosulphite and alkali to bring the total concentrations of these assistants in the diluted bath to the values given in the table for dyeing. If it is necessary to use more than 3 or 4 ounces of color paste per gallon in the short volume, it is safer to vat with caustic potash rather than caustic soda in order to get full value from the color.

The second method is used for closed machines. The water containing the extra hydrosulphite and alkali which are necessary for the dilution of the concentrated vat according to this method is first circulated through the machine. Then the concentrated solution of color which has been vatted separately is added and the circulation of dye liquor through the machine is continued in the usual manner.

The amounts of hydrosulphite listed in Table II for corresponding amounts of caustic soda or caustic potash may be greater than many are using successfully at the present time. However, the maximum concentrations of hydrosulphite given will be found to work satisfactorily under any and all circumstances in any type of open or closed machine where the color is dyed either soon after reductions or several hours later. In other words, the quantities of hydrosulphite suggested provide for the greatest possible air oxida-

tion because of delayed dyeing or excessive splashing, and yet at the same time give the best results where there is little air oxidation. The use of the maximum quantity of hydrosulphite makes the solution slightly more rapidly dyeing than the use of lesser amounts.

On the other hand, since the cost of sodium hydrosulphite is an item which must be considered in vat dyeing, it is sound practice to use only enough hydrosulphite to provide a reasonable excess over the amounts used up by the actual reduction of the color and by the air oxidation before and during dyeing for the particular process at hand. A good rule to follow is to use at least two-thirds as much hydrosulphite as caustic soda even where there is very little air oxidation. Therefore, in general, the amount of hydrosulphite employed for the dyeing of Blue BCS will vary from two-thirds to one and two-thirds the weight of the sodium hydroxide. The ratio chosen should be adapted to the particular situation.

The conditions for the reduction in the jig of BCS which has been padded in the pigment form in the presence of gums, and which has been dried in the cloth, follow from the data in the table. The jig is filled with enough water at 120° F. to cover the rolls after the first end. The weight of the water should never be less than three times the weight of the cloth. Sufficient caustic soda is added to give a concentration of 1½ ounces of sodium hydroxide per gallon. Then all the hydrosulphite is sprinkled in and the liquor is well stirred. The amount of sodium hydrosulphite concentrated employed should be equal to the weight of sodium hydroxide. After the cloth has been given several ends, the dyeing is oxidized and soaped according to standard practice. The temperature during the reduction should not be allowed to fall below 110° F.

Factors in Reduction

The ability of a mixture of sodium hydrosulphite and caustic alkali to act as a reducing agent must be considered as the product of two factors—namely, a quantity factor and an intensity factor. These factors are more or less analogous to the ampere and volt used in electricity. The quantity factor is dependent entirely upon the amount of hydrosulphite present and is measured by the amount of oxygen which the solution can absorb. The intensity factor of this reducing combination is dependent upon two things: the concentration of alkali, or pH, and the concentration of hydrosulphite. Of these two, the pH, or active alkalinity, apparently has more influence on the intensity factor than the concentration of hydro. Some physical chemist ought to measure the reducing ability of caustica hydro mixtures in the same way that the developing rates of photographic developers have been measured. At least, it is evident from our experience in the vatting of dyestuffs that if a certain concentration of caustic alkali is found best for reduction, the concentration of hydrosulphite can be varied within certain limits without decreasing the effectiveness of the reduction. In other words, although satisfactory results can be obtained under some conditions by using as little as two-thirds as much sodium hydrosulphite as caustic soda, it is imperative to use the full concentrations of caustic alkali recommended in Table II.

TABLE II

Vatting and Dyeing of Ponsol Blue BCS Double Paste

Concentrations Suitable Only for Dyeing

Ponsol Blue BCS Double Paste Oz. per Gal.	Caustic Soda Oz. per Gal.	Caustic Potash Oz. per Gal.	Sodium Hydrosulphite Maximum Oz. per Gal.
0.00	.67	...	1.10
.25	.75	...	1.25
.50	.88	...	1.50
1.00	1.10	...	1.90

Concentrations Suitable for Both Vatting and Dyeing

Ponsol Blue BCS Double Paste Oz. per Gal.	Caustic Soda Oz. per Gal.	Caustic Potash Oz. per Gal.	Sodium Hydrosulphite Maximum Oz. per Gal.
2.00	1.50	2.10	2.50
3.00	1.80	2.50	3.00
4.00	2.00	2.80	3.50
5.00	...	3.40	4.00
6.00	...	3.70	4.50
7.00	...	4.00	4.75
8.00	...	4.20	5.00

Reduce for at least ten minutes at 110 to 115° F.
Ounces per gallon are equivalent to grams per 133.5 c.c.

A characteristic of the anthraquinone vat blues, which sometimes give trouble under improper dyeing conditions, is the ease with which the sodium salt of the leuco derivative crystallizes out of solution. It forms long, thin, hay-like blue needles, which can be easily distinguished from oxidized or unvatted color by examining a drop of liquid from the vat with a low power microscope at a magnification of about 50 diameters. If enough leuco salt separates out, the bath becomes slimy because of the interlacing of the long needles. A vat prepared with sodium hydroxide and containing more than 5 ounces of Ponsol Blue BCS Double Paste per gallon nearly always develops this sliminess.

The salting out of the leuco compound, however, can be very easily avoided merely by changing from sodium hydroxide to a chemically equivalent amount of potassium hydroxide in the dyeing recipe. The solubility of the potassium salt is so great that even with 8 ounces of Ponsol Blue BCS Double Paste per gallon, an appreciable amount of sliminess is not developed when using caustic potash at temperatures above 110° F. Furthermore, a vat prepared with potassium hydroxide and containing even as much as 2 ounces Ponsol Blue BCS Double Paste per gallon can be cooled to room temperature and heated back to 115° F. without losing any strength from the salting-out effect.

Use of Potassium Hydroxide

With regard to recommending the use of caustic potash in dyeing Ponsol Blue BCS Double Paste, we believe in those cases where the solubility of the leuco really becomes a problem, it will more than pay the dyer in obtaining full color value from his blue to substitute potassium hydroxide in his recipes for the less expensive caustic soda.

Of far greater importance from the viewpoint of the manufacturer, however, is the fact that the use of potassium hydroxide in this situation will practically eliminate the probability of complaints with respect to solubility. For dyeing low concentrations of Ponsol Blue BCS Double Paste — that is, less than 2 ounces per gallon—at temperatures above 110° F., both sodium and potassium hydroxides in chemically equivalent amounts give identical results in shade, fastness and strength. On the other hand, 4 ounces per gallon of color paste is the absolute upper limit at which sodium hydroxide may be employed without solubility difficulties.

What can the dyer do with a vat of Ponsol Blue BCS Double Paste which has gone out of solution because of the salting out of the leuco compound? If he adds more caustic soda and hydrosulphite he simply makes the conditions worse by further decreasing the solubility of the sodium salt of the leuco acid. Heating to 120° F., or even to 140° F. if he is not interested in chlorine fastness, may cause partial re-solution of the leuco crystals. If heating of the vat is not effective the value of the color can be recovered by using up the dye from a more dilute solution. For dilution use two parts of warm water sharpened with 0.4 ounce caustic potash and 0.5 ounce hydro per gallon. The best procedure is to avoid the difficulties of solubility by using potassium hydroxide in the first place for concentrations of Ponsol Blue BCS Double Paste above 3 ounces per gallon.

There are dyers who have the idea that the solubility of Ponsol Blue BCS Double Paste is connected in some way with the color of the original paste. We have very carefully tested the relative solubility of several lots which varied slightly in the greenness of the blue color of the pigment. In order to do this we made use of the successive dyeing method already described and also made observations with the microscope. So far we have never been able to detect any difference in the solubility of different lots.

The important point which cannot be too strongly stressed is that slight differences in temperature and quantities of reagent when using caustic soda make more difference in solubility than any differences which may exist between lots. The greenness of the finished paste due to the presence of some of the dye in the azhydrine form can be increased by slight variations in the final steps of manufacture without any effect whatsoever on the solubility of the leuco compound. Both the green and the blue pigment reduce to exactly the same state in the vat.

Purpose of Soaping

Dyeings of any of the vat colors are improved by a vigorous soaping. For the Anthraquinone Blues this soaping has a threefold purpose: First, the removal of unfixed pigment; second, the brightening of the color, and third, the development of the normal reddish blue shade. However, only a very brief treatment is sufficient to remove mechanically adhering dye in the case of the blues since they bleed very little during the soaping operation if they have been properly applied. On the other hand, as long a time as 10 or 15 minutes is required to bring out the brightness of the dyeings to the fullest extent.

The chemistry of the effect of the soaping process in reddening the Anthraquinone Blues has been thoroughly covered. But a few practical suggestions on the reaching of the end point in this reddening may be valuable, especially for those situations where a long soaping is not feasible from the standpoint of production. In the first place, the effect of temperatures on the reducing action of soaping is very marked. A decrease of 15° F. approximately doubles the time required for the development of the same shade. For this reason one should try to keep the temperature of the soaping solution at least above 205° F.

It is possible to lessen the time required for the development of the normal shade by the use of a reducing agent in the soap bath. The best chemical for this purpose is dextrose (glucose). Dextrose is very cheap and also possesses the advantage of tending to increase the brightness of the dyeing. The use of one ounce of

dextrose and a half an ounce of soda ash to the gallon decreases by at least a factor of ten the time required to attain the same shade of soaping, and this it does without detracting whatsoever from the general fastness properties. Sulfoxite C has been tried in the soap bath for the same purpose and has been found to be quite effective. However, it is more expensive and offers no advantage over the cheaper dextrose.

After the bleaching of cotton dyed with the Indanthrene Blues it is customary to spring back from the green shade by passage of the goods through a cold hydrosulphite bath. The efficiency of the spring back can be materially increased by a subsequent rinse in boiling water. The hydrosulphite bath itself should not be hot because of the instability of sodium hydrosulphite at higher temperatures.

Initial Loss of Chlorine

It has been pointed out that the presence of chlorine in the indanthrene molecule decreases the ease with which the blue N-dihydro-azine can be oxidized to the green azhydrine. When BCS is first vatted there is a rather large sudden initial loss of chlorine, which is unavoidable. Subsequently there is a further very slow loss of chlorine which becomes materially greater at higher temperatures. Therefore, if the retention of chlorine fastness is an object, one should apply the color *as soon after complete reduction as possible* and the temperature of reduction and application should be kept low, namely, from *110 to 115° F.* Excessive concentrations of caustic alkali and hydro beyond the values given in the table must also be avoided for the same reason.

In conclusion, we wish to suggest the use of an exceedingly cheap assistant which very materially protects Ponsol Blue BCS from a loss of chlorine fastness. Dextrine, and to a lesser extent glucose and glue, possess the peculiar property of preventing Ponsol Blue BCS from losing so much of its chlorine fastness because of overly long reduction at too high a temperature. However, it must be kept in mind that dextrine does not increase the chlorine fastness of Blue BCS at all when the dyestuff is reduced for only fifteen minutes at 110° F. and is then dyed at the same temperature. But for more severe reducing conditions, dyeings made with dextrine are distinctly better than those made without.

In order to obtain the maximum protection and at the same time the brightest and strongest dyeings one should use as much dextrine as sodium hydroxide or three-fourths as much dextrine as caustic potash. It will be found that the use of dextrine in the recipes for the dyeing of Ponsol Blue BCS in the closed types of machines will make unnecessary the addition of glue or other retarding, leveling or dispersing agents to the dye liquor. Excellent results can be obtained with dextrine instead of glue provided the concentrations of hydro and caustic recommended in the table are carefully followed.

Discussion on Dyeing of Ponsol Blue BCS

Chairman Cady—Is there any discussion of this paper, gentlemen? I am sure you found it of great interest, as I did. Does anyone want to ask any questions?

Mr. Lunt—Can you tell us what kind of dextrine to use?

Dr. Draves—I don't think it makes any difference. Any good grade of British gum is satisfactory.

Chairman Cady—As I understand it, Dr. Draves, these figures which you have given us apply only to Ponsol Blue BCS.

Dr. Draves.—Yes.

Mr. Leitch—Is dextrine used in package dyeing?

Dr. Draves—Yes, it makes unnecessary the use of glue or other retarding agent. Also it preserves the chlorine fastness.

Mr. Haskell—What is the purpose of dextrose in the soap bath?

Dr. Draves—Dextrose in the soap bath increases the speed with which the reddening of the shade takes place. These skeins I have here were soaped for 5 minutes at 205° F. in a bath containing 1 ounce of soap, ½ ounce of soda ash and 1 ounce of dextrose per gallon. If you examine them you will see that they are very bright, as well as red.

E. S. Chapin—Did you say that dextrose in the bath speeds up the production tenfold, Was that it?

Dr. Draves—It speeds up the reddening of the shade tenfold.

Dr. Amick—Do you do this dyeing in a glass pot?

Dr. Draves—Do you mean experimental dyeing?

Dr. Amick—Yes.

Dr. Draves—Yes.

Dr. Amick—What would happen if you used an iron vat?

Dr. Draves—Iron dye vessels are said to give duller results with vat colors than porcelain, glass or Monel metal. However, I do not think the difference is very great. On the other hand, iron in solution and also calcium and magnesium are powerful precipitants of the vat colors.

E. S. Chapin—From the standpoint of printing, how much do these add to the ratios?

Dr. Draves—In printing you have a very difficult medium to deal with. You are developing your color at a high temperature. The conditions in printing are very different.

E. S. Chapin—You say that the development after aging would be helped by dextrose?

Dr. Draves—If you mean the soaping, yes.

Proceedings of the American Association of Textile Chemists and Colorists

The Dyeing of Embroidery Cotton with Vat Colors and Naphthols*

By M. A. R. Selisch
Superintendent of Dyeing, Thread Mills Company
(Marshall Field & Co.)

NEVER have I spoken before an audience with greater pleasure than I do to-night, upon the creation of this new section of the American Association of Textile Chemists and Colorists.

Although I am very happy to speak, I cannot help but wonder why my good friend Art Brainerd called on me to make a speech, when I see gathered here quite a number of the fellows who occasionally call on me to sell me something, and whom I would judge much more qualified to talk—because it's their business to talk. It seems, however, that to-night I am getting back at them.

Very probably there is not one among us to-night who has not often allowed his mind to dwell upon the various happenings in the world at large, and who has not sat back and wondered what this world is coming to. To mention a few items: We are told that the textile business is shot to smithereens; but I know that we know better. The old-fashioned dyers are rapidly disappearing; I have no idea where to, but can offer a pretty fair guess. We are dry—or, at least, we are supposed to be—and there is not the slightest doubt within my mind that we are—right now. And think of it!—the purchasing agents are buying the dyestuffs. Just think of that! What can a purchasing agent know about dyestuffs? What can possibly interest him in a dyestuff? The price; nothing more. And he is at the wrong end of the stick—and that's that.

I just mentioned that the textile business is said to be shot to smithereens. I wish to explain that this is merely an optical illusion; the textile business is just turned topsy-turvy.

Fast Colors and Fashion

Fashions change so rapidly that it is almost impossible to keep track of them. But, then, who can keep track of women? God bless them, they are making the fashions; and with this ever-changing mode or style, new fibers have come onto the market and these have brought with them new ideas and new methods of manufacturing and, what concerns us directly here to-night, new methods of dyeing.

Fashion, with its myriad of colors, has of necessity created a demand that is of very vital interest to us, and it is the one which will form part of the subject of this paper. The demand that I refer to is the demand for fast colors.

The dyeing of embroidery cotton and rayon with fast colors represents at once an absolute necessity and a problem very delicate, if not actually difficult, taking into consideration the large number of dye lots, which of necessity must be of small poundage; the very exact matching required between the various lots of one and the same color number, and, last but not least, the absolute fastness required of the product.

Not being able to cover the entire subject in the time allotted me, I shall try to give you a brief outline, touching only upon the vat colors and the naphthols.

Discoveries through excavations in Egypt and other countries of the Near East have definitely proven to us that the art of dyeing was known to mankind for thousands of years. Coloring matters then were, as has been determined through scientific analytical research, of the vegetable class, and were derived, through boiling or soaking, from herbs, the bark of trees, nuts, and even tiny insects.

Until the advent of synthetic dyes, the main dyeing processes were handed down through the ages; there is especially one which was almost generally known, and which is now universally known—the dyeing with Anil, the Indigo.

Anil, the Indigo, is a plant which, until only a decade or so ago, was extensively grown in the West Indies. The coloring matter was derived from this plant by fermentation, and subsequently by the use of copperas, or zinc dust and caustic lime, and it certainly represented an awkward and a lengthy process.

In 1881 Adolf von Bayer, a German chemist, discovered synthetic Indigo, and this product, being of much purer consistency and of much better uniformity, gradually replaced the natural product upon the market. The discovery of hydrosulphite further simplified the dyeing of the so-called vat colors.

It might be of interest at this point to see just how the word "vat" originated to classify these color types.

The word "vat" is identical with the German word *"kuepe,"* and means a large tub, especially one used for brewing. Since the extraction of coloring matter from the Indigo plant took place through fermentation, as I have explained, and the making of beer also being a fermentation process, it can very readily be seen why perhaps the word "vat" has outlived any other word which might have been coined to designate this class of dyeing

The vat dyestuff as it comes to us from the manufacturer is not very well applicable directly to the fiber. It is dissolved into the leuko compound by first making it into a paste with a soluble oil, and then stirring into this paste a strong caustic soda liquor, together with an adequate amount of water at the correct reducing temperature. Before we can use this leuko compound solution

*A paper presented before the organization meeting of the Midwest Section, held at Hotel Bismarck, Chicago, March 16.

successfully for dyeing we must reduce it; we must take away from it the oxygen. In other words, we must de-oxidize it. We accomplish this by adding hydrosulphite, which will also result in a distinct change of color of the vat liquor. The completion of the de-oxidizing process is shown us in the clearness of the vat liquor.

Yarn Dyeing with Vat Colors

The actual dyeing process consumes approximately one hour; which, of course, depends upon the quantity and the physical condition of the yarn to be dyed.

The dyeing temperature is around 120° F., which in turn depends upon the dyestuff or combination of dyestuffs used.

The yarn is first thoroughly wetted out; and I wish at this point to call particular attention to the fact that it is detrimental to the desired results to leave wetted-out yarn lie overnight. So-called air spots will show and, as some of the vat colors are very sensitive, uneven dyeings will result.

The wetted-out yarn is taken into the dye bath and handled quickly for a few turns; this will insure an even take-up of the coloring matter. I am speaking, of course, of dyeing by hand; in machine dyeing the entire lot of yarn reaches the dye liquor at one time.

After the dyeing has proceeded for twenty minutes it is advisable to test the bath for hydrosulphite content, and this is very readily accomplished through the use of Indanthren Yellow test papers. This paper will show a cornflower blue upon adequate presence of hydrosulphite in the dye bath. Hydrosulphite must be added should there be a sluggish reaction or none at all upon the paper.

The dyeing is then continued for the desired length of time and a sample is taken. Should it be the case that the sample taken does not match the dyed sample, a stock vat must be made of the dyestuff or dyestuffs to be added, and this procedure repeated until the dyeing comes up to shade.

Dyers often advocate that the dyeing of vat colors should be carried out upon bent sticks. I can only say, gentlemen, that I have found the straight stick, made from wood for cotton and from rattan for rayon dyeing, to be very satisfactory, with the exception of one instance; that is, when dyeing Vat Black it is advisable that bent sticks be used, as the fastness to crocking is thereby considerably increased.

When the dyeing process is ended, the yarn is lifted and wrung. It is then set out upon a rack to oxidize, which will take about thirty minutes to one hour.

It is well to remember that this shade is by no means finished when dyeing is ended, but that it must be well washed and soaped to develop the correct shade. The yarn is therefore washed several times in cold water to remove the caustic soda. In some instances it will be necessary to take the material through an acid bath to neutralize the caustic soda, and this is especially advisable when dyeing Vat Black, in the dye bath of which a large amount of caustic soda is required.

There are also instances where it becomes necessary to take the yarn through an acid bath to further develop the shade, as is the case when working with Indanthren Blue 5G or Cibanone Brilliant Sky Blue 8G.

The yarn must, of course, be washed again after the acid bath, and it is then ready for soaping, which takes place at the boil under addition of approximately 2 to 4% of soap. A warm wash to remove some of the soap adhering to the yarn is often advisable.

Should the dyer be called upon to dye rayon with vat colors, the dyeing procedure will be practically the same. Certain precautions must, of course, be observed in this class of dyeing which do not have to be taken into consideration when dyeing cotton, such as the mechanical handling and the addition to the dye bath of sulphite cellulose waste liquor to retard the dyeing and aid penetration and levelness. Soaping of the rayon should take place at a temperature not to exceed 170° F.

Summing up the subject of vat colors, I just wish to say that a thorough study of this class of dyes and their application upon the various fibers must be made to adequately understand the peculiarities which are experienced when working with them.

There are these outstanding features which are absolutely necessary to insure perfect results in vat color dyeing: The proper selection of dyestuffs for combinations; control of the hydrosulphite and caustic soda contents of the dye bath; proper control of the dyeing temperature; and, last but not least, the important item of proper reduction of the color.

The Naphthols

Leaving the subject of vat colors, I wish to turn now to another class of fast colors, a group of colors, the Naphthols, which are rapidly finding their way into many dyehouses, and which, I believe, will eventually replace a great amount of indanthren dyeing.

Not wishing to leave a wrong impression, I want to explain the last statement. I mean that Naphthol dyeing will replace indanthren dyeing in such cases where great stress is laid upon fastness to washing, the fastness to light being secondary. In other words, yellow, orange, blue and brown shades which can be obtained with Naphthols, and where, as I have explained, fastness to washing is the outstanding requirement, will be dyed with these colors instead of with indanthrens. In red shades certain

combinations of Naphthols with certain bases or color salts will give absolute indanthren fastness.

In 1912 the Griesheim Werke brought out the first Naphthol AS. It was found that this Naphthol would give a series of very bright and fast shades in combination with the bases known at that time. They were not only fast to washing but also to light and chlorine; if their fastness to crocking was not exactly good, it was, at least, very superior in this respect to the old Para Red.

Various brands of the Naphthol AS have since appeared upon the market, and many improvements have taken place; especially am I referring to the bases. It is now possible to obtain the already diazotized bases in the form of color salts, which not only have the advantage of being very stable but also of an easier method of application.

I am very enthusiastic about this fascinating work of dyeing with Naphthols, and the results I have obtained lead me to believe that these colors will do great work for me. I am at present replacing a large number of my shades of indanthrens with naphthol dyes.

To me it is nothing short of remarkable to note the ranges of shades which can be obtained by combining different brands of Naphthol AS with the various color salts.

If wishing would do me any good, I certainly would like to have with me to-night my good friend R. W. Marsson, the Naphthol expert of the General Dyestuff Corporation. He is much better qualified to bring before your eyes the merits of this class of dyeing, gentlemen, than I am; and he could, without question, outline to you the various dyeing processes much better and much more accurately than I am able to do it.

A Dyeing Method for Naphthols

Not being so fortunate, however, as to have Mr. Marsson with me, I shall try to give you just a brief outline of one dyeing procedure which I use repeatedly. I have selected a working formula for one of our standard shades which I am dyeing upon cotton as well as rayon.

One hundred pounds of cotton six-strand were dyed in 292 gallons of water; 4 pounds 8 ounces of Naphthol AS-SW were pasted with 12 pounds of Monopole oil; 7 pounds of caustic soda flakes were then dissolved in as little water as practicable, and this solution was stirred into the paste. A distinct change of color from grayish tan to canary yellow was at once evident. Boiling water was then stirred into the whole, and stirring continued for a few minutes.

The dye vat was filled with water to about one-fourth of its depth, and this water brought to a boil. The Naphthol paste was added to this water and the whole boiled for a little while. The dye vat was then filled with water and the temperature brought to 120° F.

The wetted-out yarn, being previously extracted, was entered into this Naphthol impregnating bath and handled for twenty minutes, after which it was raised. A fresh bath was made to which were added 2 ounces of common salt per gallon of water. The goods were then rinsed in this bath for a few minutes and again lifted. Another fresh bath was drawn, and to this bath were added 9 pounds of Fast Red Salt 3GL and 3¾ pounds of Fast Red Salt B, both of which were previously dissolved together in cold water. The yarn was entered into this developing bath and handled for thirty minutes.

It is indeed interesting, if not fascinating, to watch the instantaneous reaction which takes place as soon as the Naphthol impregnated yarn enters the developing bath.

After the developing process the material is given one cold wash, two boiling-hot washes and two soaps, also boiling-hot, followed by a warm wash to remove the soap.

For rayon the procedure is somewhat different.

Fifty pounds of rayon six-strand were dyed in 250 gallons of water; 4½ pounds Naphthol AS-SW were made into a paste with 4½ pounds of alcohol. To this paste was added 4½ pounds of caustic soda flakes previously dissolved in cold water, and the whole stirred until the change of color, of which I have spoken before, took place.

The dye bath was made up in the same manner as has been explained for the dyeing of cotton and the Naphthol paste added to this bath, the whole being boiled for a short time.

After the dye vat had been filled with water and the temperature brought to 120° F., 4½ pounds of caustic soda, previously dissolved, and 3 pounds 7 ounces of Nekol BX Dry, previously dissolved in boiling-hot water, were added.

The rayon in the dry state, not having been wetted out, was entered into this impregnating bath and handled for twenty minutes. No rinsing took place out of the impregnating liquor, but the material was directly entered into the developing bath, made up with 12 pounds of Fast Red Salt 3GL and 4 ounces of Fast Scarlet Salt R, dissolved as I have explained previously.

The material was handled in the developing bath for thirty minutes, lifted, washed once in a cold water, then given a bath containing approximately 1 ounce of hydrochloric acid per each 10 gallons of water, rinsed again in a cold water, and finally soaped at 170° F. for twenty minutes. A warm wash followed, which also contained the finishing oil.

To dye with Naphthols, gentlemen, is a very simple matter after one has become used to their peculiarities. There are, of course, certain definite features which must

be carefully watched to insure the proper results: Perfect clearness of the impregnating liquor is absolutely necessary; the temperature should not be hotter than 120° F., as a higher temperature will give a yellower shade; and the developing bath should be as cold as possibly can be made, unless the dyer wishes to use ice.

To give you an idea, gentlemen, just what I have done in my line of work with vat colors and Naphthols, I have brought along with me a number of the more interesting specimens of my work and I invite you most heartily to inspect them.

The Handwriting on the Wall

There remains now only one thing more which I wish to remark upon and that is the organization of this section of the American Association of Textile Chemists and Colorists. I wish to remark upon this event with a story. Gentlemen, there is a tremendously dramatic element in the biblical story of Belshazzar's feast at Babylon. The mighty king was the central figure of a great spectacle, one of elaborate elegance, of sumptuous feasts and of wild merrymaking. His dominion and his power seemed secure. Suddenly, above the great candlesticks, against the wall there appeared the fingers of a hand, and these fingers wrote a momentous legend in which Daniel read the doom of Belshazzar, after soothsayers and astrologers had failed to make an interpretation.

Belshazzar had been weighed in the balance and found wanting, and that very night the business of governing Babylon passed into other hands.

Doubtless Belshazzar deserved what he received; but even at this late day I want to speak a good word for him: He called in experts to translate for him the handwriting upon the wall.

We have gathered here to-night to call into existence this new chapter of the American Association of Textile Chemists and Colorists for just exactly this very same purpose—to get together; to intelligently co-operate with each other, and to call in experts from time to time to have them explain to us their methods of handling various problems intimately connected with chemistry and dyeing. We are calling into existence our new section, gentlemen, because of the fact that we are able to recognize the "handwriting upon the wall." I thank you.

OUTING NOTICE

Northern New England Section

THE annual summer outing of the Northern New England Section will be held this year on June 14 at the Merrimack Valley Country Club, Metheun, Mass. All arrangements for the comfort and enjoyment of members and their guests are being worked out by special committees, and details will be announced in a later issue.

Applicants for Membership

Butler, William H., demonstrating salesman, Newport Chemical Works, Room 502, 68 Devonshire Street. Boston, Mass. Sponsors: W. H. Zillessen and W. A. Keating.

Hoppe, Clemens F., colorist, Oriental Silk Printing Company, Haledon, N. J. Sponsors: E. J. Portner and P. J. Wood.

Sharman, Bert H., salesman-demonstrator, Nyanza Color & Chemical Company, Inc., 549 W. Randolph Street, Chicago, Ill. Sponsors: Charles E. Maher and F. H. Proudfoot.

Youngblood, J. M., overseer dyeing, Griffin Manufacturing Company, Griffin, Ga. Sponsors: R. D. Sloan and L. L. Bamberger.

Changes of Address

Cassel, Norman, 52 Walnut Avenue, Montclair, N. J.

Callahan, Chas. A., 178 Chestnut Street, Waltham, Mass.

Hamilton, Gilbert, 16 Clarence Street, Worcester, Mass.

Myers, Jr., W., 55 Oriole Avenue, Providence, R. I.

Killheffer, John V., care of Newport Chemical Works, Inc., Greenville, S. C.

Logan, George H., 3934 South Parkway, Louisville, Ky.

McGibbon, James, care of American Glanzstoff Corp., 180 Madison Avenue, New York, N. Y.

Rodalvicz, Francis R., 8 Sutherland Street, Andover, Mass.

Shea, John Francis, Box 334, Y. M. C. A., Norristown, Pa.

Travers, Joseph E., 156 Pearl Street, Boston, Mass.

Vieira, N. R., care of Newport Chemical Works, Inc., Greenville, S. C.

Warner, John F., 307 Pulman Avenue, Port Chester, N. Y.

Williams, S. H., care of General Dyestuff Corp., Chattanooga, Tenn.

Addresses Wanted

The present addresses of the following members are unknown. The last known address is herewith given:

Walsh, Frederick C., 1118 South Forty-eighth Street, Philadelphia, Pa.

Roun, Carl L., Toledo, Ohio.

FUGITIVE TINTS FOR SILK THROWING DEVELOPED

Silk Association Announces Results of Tests

Throwsters dye tints, guaranteed as fugitive if used under proper conditions, are now being distributed to the silk industry by the United States Testing Company, Inc., by a co-operative purchase plan worked out with the Silk Association of America, Inc. The purpose of this plan is the elimination of claims resulting from streaks left in silk when a tint fails to boil out.

Preliminary laboratory tests on the fugitiveness of dye tints have been conducted by the United States Testing Company, who tested a large number of tints for fugitive qualities. With the completion of research work, the testing company is now able to offer to the silk industry sixteen colors which, both from the laboratory and practical point of view, are fugitive. A stamp is placed on each package to indicate that the tint contained therein is fugitive if used under proper conditions, and instructions are enclosed stating conditions under which they are to be used. The testing company will continue research work for the purpose of developing additional fugitive tints for silk as well as a line of tints for the various types of rayon.

All branches of the silk industry are expected to benefit from this co-operative purchase plan. Broad silk manufacturers will be saved expense and trouble resulting from streaks left in woven silk. Claims will be minimized for waste and thrown silk dealers. Hosiery and rayon manufacturers will have assurances of fugitiveness of tints, which they use to distinguish between different yarns.

Indications are that practically the entire silk industry will enter upon this co-operative purchase plan, which is supported by several divisions of the Silk Association.

SUMMARY OF DYE IMPORTS FOR 1928

THE imports of coal-tar dyes during 1928 (preliminary figures) were 5,348,227 pounds, with an invoice value of $4,322,621. This represents an increase of 1,115,181 pounds, or 26 per cent, and of $908,735 or 27 per cent more than that of 1927.

Table I shows the imports of coal-tar dyes for 1928 and for the years 1920 to 1927, together with the imports for the fiscal year 1914. The quantity for the year 1914 was taken from Department of Commerce, Special Agent Series 121, and the value from Commerce and Navigation. The figures for the years 1920 to 1927, inclusive, were taken from the Annual Census of Dyes and Other Synthetic Organic Chemicals, published by the United States Tariff Commission. The final figures for the dye imports of 1928 will be published in the Census of Dyes and Other Synthetic Organic Chemicals for that year.

TABLE I

Imports of Coal Tar Dyes, 1920-1928 and 1914

Year	Pounds	Value
1928*	5,348,227	$4,322,621
1927	4,233,046	3,413,886
1926	4,673,196	4,103,301
1925	5,209,601	4,637,240
1924	3,022,539	2,908,778
1923	3,098,193	3,151,363
1922	3,982,631	5,243,257
1921	4,252,911	5,156,779
1920	3,402,582	5,763,437
1914	45,950,895	9,502,714

*Preliminary figures.

Table II is a summary of the dyes imported in 1928 and 1927, classified according to method of application. There is also shown the percentage of the total imports for each class of dyes for these two years. With the exception of the sulphur, color-lake and spirit-soluble dyes, there has been a marked increase in the imports of each class of dyes. The proportion that each class represents of the total imports shows slight variation for the two years.

TABLE II

Imports of Dyes Into the United States, Classified Method of Application, 1927 to 1928

	1928	
	Pounds	% of Total
Acid dyes	992,767	18.56
Vat dyes	2,315,494	43.30
Mordant and chrome dyes.	476,961	8.92
Direct dyes	916,858	17.14
Basic dyes	424,969	7.95
Sulphur dyes	125,350	2.34
Spirit-soluble and color-lake dyes	86,075	1.61
Unidentified and unclassified special dyes	9,753	.18
Total	5,348,227	100.00

	1927	
	Pounds	% of Total
Acid dyes	654,729	15.47
Vat dyes	1,730,967	40,89
Mordant and chrome dyes.	488,605	11.54
Direct dyes	721,342	17.04
Basic dyes	334,526	7.90
Sulphur dyes	137,864	3.26
Spirit-soluble and color-lake dyes	134,778	3.18
Unidentified and unclassified dyes	30,235	.72
Total	4,233,046	100.00

AMERICAN
DYESTUFF REPORTER

Devoted to the use and application of dyestuffs and the mechanical equipment incidental thereto.

LOUIS A. OLNEY
PROFESSOR OF CHEMISTRY AND DYEING, LOWELL TEXTILE SCHOOL
Directing Editor

CLAYTON HOAGLAND
Managing Editor

MYRON DREW REESER
Advertising Manager

Published biweekly by
HOWES PUBLISHING CO., INC.
90 William Street, New York City

A. P. HOWES, *President* E. S. PREDMORE, *Secretary*

Subscription price $5.00 per year; Canadian $5.50; foreign $6.00

Vol. XVIII May 27, 1929 No. 9

WHO SHOULD PRESCRIBE TEXTILE RESEARCH?

AN old tramp steamer three days out of port with a heavy cargo of coal learned that it was in the path of a storm sweeping along the coast. Below decks two sailors discovered that a wooden bulkhead between the coal bunkers was strained so that any sudden list to starboard or port might shoot tons of the cargo into the adjoining bunker, throwing the ship on its side, probably spring the plates and starting an irreparable leak.

The sailors spoke to the engineer, urged that the captain be informed immediately and suggested that the crew be put to work shoveling the coal into an empty forward compartment.

"No," said the engineer, "the captain has not seen the need of such a change in cargo or he would have ordered it before now. Let us wait until he realizes the need and issues the order. It is not our place to force any action upon the captain."

This story is frankly intended to be a fable with a moral. Substitute for the sailors who discovered the trouble all those technical men in the textile industry who believe that a laboratory for fundamental research on textiles should be established as soon as possible. The engineer, on the other hand, represents the minority who believe that the technical men of the textile industry *should not* openly advocate any such research laboratory, nor establish one financed by the whole industry on a co-operative scale, until the business leaders of the industry realize the need for research.

Prof. Charles E. Mullin of Clemson College, South Carolina, in a communication to the American Association of Textile Chemists and Colorists published in the Proceedings in the last issue, expressed this negative attitude of the conservatives and he expressed it in words that leave no doubt of their position toward co-operative textile research. Professor Mullin, who is chairman of the Piedmont Section of the A. A. T. C. C., sharply criticized the proposal to establish an association laboratory on a scale broad enough to undertake adequate fundamental research on textiles. He maintains that the technical men of the industry should not "try to force the laboratory down the industry's throat before it realizes the need." He maintains that the demand should come from the industry, not from the ranks of the dyers and chemists and physicists.

The REPORTER has no quarrel whatever with Professor Mullin or with his personal opinions on the subject of research, and believes with Dr. Killheffer, president of the A. A. T. C. C., that any criticism of the proposed laboratory is a healthy sign of interest among the members. But it must be assumed that Professor Mullin speaks for a group, and therefore it seems to us important to throw light upon that group's negative attitude in order that all those who do believe in setting up a central research laboratory may know the principle on which they are opposed by the conservatives.

That principle we have tried to express in the analogy of the ship engineer who refused to tell the captain of the need for an action which was plainly called for, under conditions that the captain knew nothing about *because he did not work below decks.* C. H.

THE TARIFF ENTERS THE RING

ONE of the basic laws of human behavior teaches that every one of us has sporting blood in his veins, at least to a degree that permits everybody but a few pious pacifists to enjoy a good fight. But fortunately or otherwise the ability to stir up a successful scrap is uncommon; fight promoters are more often born than made. How remarkable, then, that a number of gentlemen who were all obviously born to promote dishamony among us should have been chosen to frame a revised tariff! For we must concede that those who have attempted to rebuild our tariff act have achieved a success in fight promoting that out-Rickards the Tex of yore. With a positive genius, so it appears, they have drafted a tariff that has stirred up more discord among the business element in these United States than anything since Prohibition.

If this preamble should cause any reader to believe, however, that nobody is pleased with the new tariff, it has been misleading. The dye manufacturers, for one, have not been heard to utter a growl or a whine against those schedules and rulings of the Hawley-Smoot tariff bill which affect their particular products. Does this mean that they got what they wanted? It does not, for the tariff does not give to the industry the complete satisfaction which would be ours had all the industry's requests been cared for by the Ways and Means Committee. But nobody is kicking audibly because the outlook is not so dark that it couldn't be much blacker. Things are, in short, not so bad for the dye industry—if they stay that way.

Let us recall very briefly the requests that were made

by the dyestuff manufacturers before the hearings of the Ways and Means Committee when testimony was submitted to aid the committee in its disagreeable job of adjusting the old tariff to meet new conditions. In the brief presented at Washington by the spokesman for the dye industry, the following changes in the chemical schedules were recommended:

1. An increase in the rates of the basket clause (Par. 5) from 15 to 40 per cent to protect the market for many new domestic chemical products that will be developed during the next few years and that may fall into this paragraph, which covers such a wide range of chemicals.

2. In paragraphs 27 and 28 covering coal tar products, an increase in rates to the original 55 and 60 per cent ad valorem, as fixed for the first two years of the 1922 tariff.

It was also urged very strongly by our dye industry that the *American market price* be retained as the basis for assessing the value of competitive dye imports, rather than any form of foreign or United States valuation. This point was supported with great emphasis in the brief because of its paramount importance to the welfare of the industry.

What the new tariff gives in the way of protection for the domestic dye industry was outlined in these pages two weeks ago, but it may be summed up here for those who overlooked that tariff story. There has been no increase in the basket clause rate, nor in the rates of paragraphs 27 and 28. But the American selling price stands as the basis for appraising those foreign dyes and other coal tar products which compete with domestic colors. Nothing could be more satisfactory from the standpoint of protection than this evidence of favorable sentiment, among those who revised the tariff, toward the American valuation basis. For non-competitive coal-tar products the United States value remains as the basis. The distinction between these two methods of valuation has been explained before, and it will be elaborated in a future comment upon the tariff, for it may become a major issue in the Congressional debates.

While there has been no change in rates nor in valuation affecting dyes, there has been given to paragraphs 27 and 28 a provision which may be of far-reaching importance to our industry. This new feature is nothing less than a removal of the clause which cut off the dye paragraphs from the benefits of the *flexible provisions* of the tariff. The change will permit the President to raise or lower the rates on dyestuffs in the future, as he has on other products in the past, not more than 50 per cent, in order to equalize the conditions of competition in our markets, should occasion require such changes in rates.

Although the dye industry has raised no loud cry against the treatment it has received at the hands of our Congressional fight promoters, it is not to be assumed that the sky is unclouded. One evil remains uncured by the new tariff bill: The higher-priced, higher-type dyestuffs are not yet adequately protected; and these form the bulk of our imports by variety and by total poundage, compared with other types of colors.

Now, there is opportunity here for skepticism. There are those who look upon any attempt to raise tariff rates as merely a scheme for increasing the profits of industry. Nor will any thought be given by these logicians to what happened as a result of the protection afforded the cheaper dyes under the present tariff. In this class the manufacturers have been able to develop their production to such an extent that to-day about 60 per cent of the total quantity of dyes used in this country are sold here at prices as low as or lower than pre-war prices.

Only a higher ad valorem rate or some sliding scale of rates will protect our vat dye markets, however, and to expect this in the new tariff is apparently out of the question. Meanwhile, the real debate over the tariff has just begun. As this issue goes to press the members of the House are meeting for a full discussion of the new act. All signs point to a fight concentrated not upon rates but upon the new administrative provisions of the tariff, upon the basis of valuation, upon the flexible clauses and upon the power given under these provisions to the President and to the General Appraiser. There have been changes in rates to suit certain groups, of course, but the real point of attack in both House and Senate will be the administrative sections.

The flexible provisions have long been a major issue among those who sleep, eat and talk tariffs. Before the Hawley-Smoot bill becomes a law those provisions may be yanked out altogether or modified and amended beyond recognition. In the 1922 Tariff, now in effect, the flexible clauses apply to every paragraph except 27 and 28 covering coal tar products. As we have explained, this restriction has been removed and the benefits of the flexible provisions are now extended to the dye paragraphs. They become as a consequence a subject of importance to manufacturers and consumers of dyestuffs, for very much may depend upon their inclusion in the new bill. They should, it is needless to say, be thoroughly understood by those whose interests are related to the domestic dye industry.

In the 1922 Tariff the need for any changes in rates under the flexible provision is determined by a special investigation carried out by the Tariff Commission, this including a long study of foreign production costs of the competing product, *if* those costs can be obtained abroad. Under the new ruling embodied in the tariff now before the House, however, the need for rate changes may be determined by the President after a study of the "conditions of competition" in domestic markets. The changes are to equalize not the difference between our costs of production and those of the foreign manufacturer, but the *conditions of competition.*

This ruling has caused a disturbance among certain old-timers in Congress who view with alarm any innovation in tariff making. As a result we may expect to see dust and feathers fly around the flexible provisions in

the Senate. The House has voted against their amendment. But another battle of equal importance will no doubt be waged on the field of Valuation, and efforts may be made to amend the clause that gives the General Appraiser the power to assess duties on American market price if foreign or United States value of the merchandise cannot be determined.

Both flexible provisions and basis of valuation, therefore, deserve all the study that may be given to them by those in the dye and textile industries who realize how much the tariff will affect their business. It may be a long and lusty fray, carried on into the dog days of summer, for the tariff is still young. We should not swoon in surprise at anything that Congress may do to the tariff, for the situation is not unlike a crowd of hungry school boys with a basket of lunch.

NEW YORK CHAPTER OF BRADFORD-DURFEE ALUMNI FORMING

Members of the alumni of the Bradford-Durfee Textile School who are located in the vicinity of New York City will doubtless be glad to know that the formation of a New York Chapter is now being arranged. An informal dinner and meeting was held May 8, and plans were discussed for organizing such a body of the alumni. The temporary committee in charge consists of James L. Giblin, '25; John Hunter, '22; H. C. Robinson, '23, and Sydney Springer, '27. Dean Henry W. Nichols and Charles Muir, '13, are members ex-officio. Dean Nichols made a special trip to New York to attend the dinner.

FAVORABLE OUTLOOK FOR BRITISH CHEMICALS REPORTED

There is not the shadow of a slump in the trade of Great Britain's chemical industry if we may judge by a report recently issued by Trade Commissioner Homer S. Fox, in which the British chemical trade in 1928 is surveyed. The current year is expected to record a continuance of the steady gains which have been made during the last year, according to this survey, and it is pointed out that chemical production in England for the first three quarters of last year was appreciably better than in 1927.

Home demands for chemical products in Great Britain was restricted to a considerable extent during 1928, particularly in heavy chemicals, by a continued depression in the consuming industries. However, this was largely offset by substantial increases in the chemical requirements of a number of newer and more rapidly developing industries, such as rayon, automotive radio, glass and synthetic resins.

I. U. Stronach, formerly head dyer at the Hampton Company, East Hampton, Mass., has been promoted to the position of superintendent of dyeing, bleaching and mercerizing. Charles W. Taylor has succeeded Mr. Stronach as dyer.

CALCO BUYS CROWN CHEMICAL CO.

The Calco Chemical Company, Inc., announces that it has purchased the plant and good-will of the Crown Chemical Company. No change, it was stated, will be made in the manufacture of Crown products, which include para-nitraniline, meta - nitro - para - toluidine, para-phenylene-diamine, para-aminophenol and acetanilide. In approving the consolidation with the Calco Chemical Company, Inc., the owners of the Crown Chemical Company expressed the belief that a consolidation would result in greatly increasing the field for Crown products and also would make available greater facilities for distribution and manufacture. The Calco Chemical Company, Inc., has its works at Bound Brook, N. J., and the Crown Chemical Company has its plant at Keyport, N. J.

The announcement by the Calco Chemical Company, Inc., states that all orders for Crown chemical products should be addressed to the Calco Chemical Company, Inc., at Bound Brook, N. J., or to one of its several branches.

NEW DYESTUFFS

New Katigen Colors on Grasselli List

Among the recent additions to the shade card of the Grasselli Aniline Works are two new members of the Katigen series of sulphur colors, Katigen Orange CA and Katigen Brown R. Leaflets describing the properties of these two new shades have been issued by General Dyestuff Corporation of New York.

The Katigen Orange is said to be noted especially for its brightness, and is described as being of very good fastness to light, to cross dyeing and to washing. It is a suitable color for padding and for machine dyeing, and according to the circular is free of copper and therefore useful for cotton materials which are later to be vulcanized.

The new Katigen Brown R is a bright shade of chestnut, and according to the manufacturers is recommended primarily for the production of full shades of brown in combination with other shading colors for all kinds of cotton materials. It is further claimed that its fastness to light is satisfactory and is improved by aftertreatment with cotton, and that it also possesses good washing fastness and fastness to cross dyeing.

The General Dyestuff Corporation has issued circulars covering also the properties and application of Helindone Green B Vat, manufactured by the I. G. Farbenindustrie. This color is described as a new vat color in liquid form for wool, distinguished by its fullness and brightness of shade, and according to the description possessing excellent fastness properties. It may be used in conjunction with other wool vat colors, such as Helindone Brilliant Yellow G to produce bright yellowish green shades. Swatches of this color and full dyeing directions appear in the circular.

MANOIR RICHELIEU ALMOST COMPLETED

From Murray Bay, Canada, comes the news that the new Manior Richelieu, which has recently been advertised in the pages of the REPORTER, is now being finished to accommodate the summer tourist. Building operations on this hotel were commenced eight months ago, and were carried forward under many difficulties. But by carefully co-ordinated effort Jeanne d'Arc marble arrived from France for the entrance hall and rare prints and engravings for the Canadian collection came from England to be fitted into their allotted places.

To-day, on the site of the old Manoir, with its views up and down the St. Lawrence, the new building stands like a mansion of 18th century France, towered and turretted, with all the grace of a country home. It has been designed to furnish accommodations for 600 guests, The interior decoration scheme is said to be unique in hotel decoration, capturing the atmosphere of two centuries ago and moulding it into the luxuries of modern living. A large swimming pool adjoins the ballroom in a building modeled after the Chateau de Ramezay; inside the spirit of the period is retained with a timber roof and musician's gallery. South of the building is the open air swimming pool, supplied with flowing salt water artificially heated.

Six miles of bridle paths circle a golf course which, it is reported, will be the scene of several notable tournaments during the coming summer.

The art treasures of the new Manoir comprise rare and extensive collections of Canadian and American engravings, prints and paintings and hundreds of old French prints of unusual historical value and beauty. Most of the pictures and maps are on display in the Murray Room; others are shown in the West Gallery and many are used in appropriate places throughout the hotel. From a historical aspect the collection has attracted widespread attention in Canada among scholars, historians and others interested in their country's story.

NEW FINISHING OILS

A new series of assistants for dyeing and finishing has been placed on the market by the General Dyestuff Corporation under the general brand name of Prestabit Oils. A leaflet describing the properties and uses of these products explains that they can be applied to either cotton or wool, according to the brand used. Prestabit Oil BM is recommended for use, according to this leaflet, in the mercerizing of fabrics and yarns and is described as being perfectly stable in strong caustic and suitable for mercerizing even gray goods without previous boiling out.

The two brands of these oils used in processes other than mercerizing are Prestabit Oil G and V. They are said to be stable in liquors containing inorganic or organic acids, lime, and Epsom salts. The Prestabit Oil V is said to be especially useful as an addition to the padding liquor with vat colors, and according to the description, when used in the two-bath padding process a perfect penetration on thickly woven cotton goods or linen may be obtained.

At Paterson, N. J., the Reynier Dye Works have been incorporated by Anthony G. Gillott, of that city, formerly secretary of the Associated Dyeing & Printing Corporation, and E. H. Reynier, of Passaic, who was vice-president for many years of the Eagle Piece Dye Works. They have purchased the dyeing plant and equipment at Easton, Pa., formerly operated by Haytock & Croninmeyer, who discontinued that department of their business late last fall.

The Manoir Richelieu Nears Completion

FLAX AND RAYON FABRICS

(*Continued from page 348*)

erately high temperatures but which will act almost equally well at less heat, if a slightly paler shade is not out of the question. A temperature of about 25° C. should not be exceeded, and the strength of the vat should not be more than 10%, as getting above that may result in the cellulose acetate yarn becoming stained, which would interfere with the purity of the color if cross-dyeing is being aimed at. It will be seen from the subjoined table, which has been supplied by the manufacturers of the Caledon colors especially for this purpose, that the dyes are divisible into three groupings according to the quantity of caustic soda that is needed to dissolve the colorless leuco-compound resulting from the reduction of the dyestuff.

Color	Working Temperature (deg. Cent.)	Group
Caledon, Blues, GC, RC	50	1
Caledon Blues, GCD, GCP, RR	50	1
Caledon Blue R	60	1
Caledon Brilliant Blue R	60	1
Caledon Brilliant Purple RR	60	1
Caledon Brilliant Violet R	40	3
Caledon Brown B	60	1
Caledon Brown G	50	3
Caledon Brown KT	27–38	2
Caledon Brown R	40	3
Caledon Dark Blue	60	1
Caledon Green B	60	1
Caledon Gold Orange	60	1
Caledon Jade Green	44	1
Caledon Orange RRT	60	1
Caledon Purple R	60	1
Caledon Red BN	27–38	2
Caledon Reds, FF, 5B	50	3
Caledon Red Violet 2RN	27–38	2
Caledon Violet RN	50	2
Caledon Yellow G	60	1

Although in this place dealing only with goods in the piece, the following formulas for the setting of the vat will apply equally well for fiber flax in cops, cheeses or beam-warp. The weights given are for batches containing 100 pounds of linen yarn, quite apart from the rayon that is woven in with it. The dyeing is carried out in a closed machine.

	Group 1	Group 2	Group 3
Water, softened (gallons)	60—95	60—95	60—95
Caustic soda lye, 53° Tw. (pints)	8—10	3¾— 5	6—10
Caustic soda lye, 73° Tw. (pints)	6— 8	2¾—3½	3¾— 5
Hydrosulphite, conc. powder (lb.)	1½—2½	1½—2½	1½—2½
Glauber salt, crystals (lb.)	None	10—20	2½—10

Dyeing with Caledon Colors

The goods will be well soaked in a bath not hotter than 75° and are passed to the dyeing machine, which contains the thoroughly softened water in which has been dissolved one-third of the necessary quantities of soda and hydrosulphite, what time the dye paste has been undergoing treatment with the remainder of the caustic and hydrosulphite with a small quantity of water in a small vessel, being maintained at the temperature indicated in the table. When the reduction is complete, the liquor is poured rapidly through a sieve into the beck a little at a time; a cover is kept over the dye solution all the while.

When the dye has been put in and the goods have properly absorbed it, the liquor is drained away; if a suction pump is available it may be brought into play here in order to remove as much as possible of the solution. Occasionally there is an addition of 7 pounds of common salt made for each 120 gallons of dye liquor; this is believed to give more clarity and brightness, but it is largely a matter of opinion.

For open vat dyeing the following modifications are needed in the formulas:

	Group 1	Group 2	Group 3
Water, softened (gallons)	240	240	240
Caustic soda lye, 53° Tw. (pints)	2¼	1⅛	¼—¾
Hydrosulphite conc. powder (lb.)	2—2¼	2¼—2½	1— 4
Glauber salt, crystals (lb.)	None	10—40	10—80

Caledon Brilliant Violet R will require 33% more caustic than the amount here named.

The following formula indicates the setting of the vat: Water, softened, 210 gallons; caustic soda lye, 1⅛ to 2¼ pints; hydrosulphite, ½ to 1 pound. The remainder of the water and the various chemicals are required for making the solution of the dye paste, which, as in the former case, is carried out in a small covered vessel. Wooden tubs or earthenware pans are very useful for this purpose if the expense of Monel-metal pots is too great. They should be kept very clean and a light color should never be dissolved in a wooden vat that has previously been used for a dark one. The whole vat is now brought up to the temperature given in the list of dyestuffs, which brings about the completion of the reduction; after this the vat is covered down and left standing until the liquor has reached the ordinary temperature of the dyehouse, when it is ready for use.

At the end of the working the excess liquor is squeezed out and the material is exposed to the action of the air for oxidation for about half an hour or less. It should then be very well washed and given a few runs through a bath of weak formic acid for the purpose of eliminating any remaining traces of alkali that may be present after the rinsing. If this is omitted there may be difficulties with the dyeing of the cellulose acetate, but the presence of slight traces of acid will not produce any ill-effects in the subsequent operations.

For dyeing the acetate fiber, this new class of anthraquinone colors, called the Celatenes, has been re-

cently placed upon the market after very extensive trials that have proved to be entirely successful. It will be noted that the process of dyeing now to be described presents none of the snags that have so often been the means of frightening dyers away from the use of this class of colors; in fact, it has been very justly stated that the Celatene dyes have put acetyl rayon on the same level as linen, cotton and woolen goods in the matter of fastness to light, washing, perspiration and other influences. As regards fastness to light in particular, it is claimed that many of the Celatene shades are equal to the top-notchers among the vat colors.

A long or a medium bath is equally effective; it may be 25 to 1 or it may be 50 to 1, provided that the batch of fabric has been well soaked before entering it in the dye liquor at a temperature of 38 to 40°. The fact that the dye solution is not perfectly clear at the start of the dyeing need cause no uneasiness, for it will be found that it gradually becomes so as the work proceeds, the steam being on until the bath is up to 70°, at which figure it is maintained for from three-quarters of an hour to one hour, or until the bath is pretty well exhausted. In the case of darker shades it may be necessary to go up to 85°. The goods are taken out, washed and finished in the usual manner. Blacks, Navy, Nigger and similar very heavy shades do not exhaust the dye baths, and therefore these should, whenever possible, be kept as standing baths, adding about five-eighths of the first amount of fresh dyestuff for each new batch that is put through.

It may be mentioned in passing that the Celatene colors find a place also in the printshop, where the addition of a suitable gum thickening and a good steaming is the only treatment required for the permanent fixation of the patterns.

These dyestuffs have no tinctorial effect upon either linen, cotton or regenerated cellulose rayons, a fact which renders them especially applicable to the union of fibers here under discussion.

Other makes of dyestuffs which are valuable in this connection are the Ionamine, Dispersol and Duranol colors; these, too, have been evolved for use with cellulose acetate, and some of them have been in use for a number of years and have proved their qualities. They have fine affinity for the fiber and are said to be easy to work and fast to light and milling.

They are applied in the following manner: The solution of dye without any additions is put into the bath and the fabric is entered at 80°, which is kept up during the forty-five to sixty minutes that the goods are working. If the dyeing shows signs of hanging fire, a small quantity of acid will hasten matters; so will a little common salt or some Turkey Red oil. These dyes are very adaptable and will work in alkaline baths also if cross-dyeing in single baths requires it. Mineral acids should be avoided in connection with these classes of dyes; it is always better to use formic. The Celatene, Dispersol, Duranol, Celanol, Ionamine and SRA dyes are all suited for the dyeing of cellulose acetate rayon.

Other manufacturers also have placed at the disposal of the dyers classes of colors which have been brought out solely for the treatment of cellulose acetate rayon.

At the close of the dyeing operations it will be necessary for the batch to be very well washed, and when softness is required the handle will be improved by running through a soap bath of normal strength. The usual plan adopted in the case of the mixed cloths is to follow the finish that is asked for in pure linen fabric of a similar grade, thus allowing the rayon to figure simply as an addition to their beauty.

Many a writer, when dealing with the linen industry, has ventured to prophesy and has found himself badly let down in one way or another; but although angels may fear to tread the ground, it may be foretold that with the improvements that are now being introduced in way of preparing fiber flax yarns, and the growing popularity of the linen-rayon mixtures, the world at large will see a vast expansion in the linen industry before it is many years older.

NEW SHADES ADDED TO DU PONT VAT COLORS

The dyestuff department of E. I. du Pont de Nemours & Co. announced last week the production of two additions to its line of vat dyestuffs, these colors being designated as Ponsol Brown 4R Paste and Sulfanthrene Blue 2BD Double Paste and Powder.

The Ponsol Brown Paste is for printing and, according to the description, possesses all of the characteristics suitable to a dyestuff made especially for the printing trade. It produces a bright reddish-brown shade said to be of very good fastness, and is useful as a self-color for the production of full shades or in combination with other vat colors on cotton, silk and rayon.

Sulfanthrene Blue 2BD Paste and the powder are identical in shade and fastness, but the paste is particularly suited for use in printing. This dyestuff is further described as a brilliant blue, greenish in light shades and redder and more bronzy in dark shades, having extremely good application properties. The powder form is prepared exclusively for dyeing.

O. E. Adamson, formerly general assistant treasurer of the Du Pont Rayon Company and the Du Pont Cellophane Company, has been elected secretary and treasurer of both companies, succeeding Clayton M. Albright.

Mr. Albright has been elected vice-president and member of the executive committee of the Du Pont Rayon Company and the Du Pont Cellophane Company, effective May 1, with offices in New York.

Stripping of Dyed Wool

Austrian Patent No. 107,569—The wool is treated at ordinary pressure, and at a temperature between 50° and 100° C., preferably not over 70°, and for a suitable time, with sulphuric acid of such a concentration that the wool and any vegetable fiber present will not be damaged. Stripping or bleaching agents, as hydrosulphite, which will increase the effect, may be previously added to the acid bath. In an example, sulphuric acid of about 50% by volume, at 70° C., is used.

Stripping of Dyed Goods, Especially Cellulose Derivatives

British Patent No. 260,289; *British Celanese, Ltd.*—The goods are treated with a solution which contains a swelling agent appropriate for the material under treatment, and which also acts as a solvent for the dyestuff which has been used. Thus, a cellulose acetate yarn, which has been dyed with a dyestuff (pigment) dispersed with Turkey Red oil, is treated with benzene at 54° to 72° C., and the treatment repeated until the dyestuff is completely removed. Instead of benzene one may use acetone, or the chlorinated derivatives of saturated or unsaturated hydrocarbons, such as tetrachlor-ethylene, dichlor-ethylene, trichlor-ethylene, alcohols, etc.

New Microscopic Test for Damaged Wool Fiber

Textil-Chem. u. Colorist 96, 9 (1928).—The method of Dr. H. Mark for determining the existence of mechanical or chemical damage to wool fiber, consisting in the use of diazobenzene-p-sulphonic acid, through which the fiber assumes a light to dark orange color, according to the extent of the damage, has not shown itself to be very satisfactory. The diazo solution decomposes too easily; it must be freshly prepared, since it may become unsuitable for use within a few minutes.

Dr. W. Sieber, of the Reichenberg Textile Research Institute, has proposed to replace this agent by a more stable one. He has employed diazotized azo dyestuffs which contain free amino groups, particularly dyestuffs which contain both an amino and a sulpho group. However, wholly satisfactory results were not obtained by him even with such typical wool dyestuffs as Naphthylamine Black.

Because of the fact that substantive cotton dyestuffs as a rule possess no special affinity for wool, so that the undamaged wool fiber would not be dyed in neutral solution, Benzopurpurine 10B was tetrazotized and the resulting solution used as a reagent. It was found that wool, which has been injured by soda and well washed (complete removal of the alkali from wool treated with soda, by mere washing with water, is commonly not possible) is dyed partly blue and partly reddish to dark red. The test with this reagent is wholly satisfactory. The wool was boiled for a few minutes in an aqueous 1/1000 solution of the Benzopurpurine 10B reagent, without any other addition, until the water ran off clear (colorless?), then examined under the microscope, with the following results:

1. Raw wool, previously scoured (presumably by solvents) and washed with water, displayed on the mechanically injured spots a deep red color, corresponding in depth of shade with the degree of injury.

2. Wool which had been treated with a 5% solution of soda for ¼ to ½ hour at 50° to 60° C., and then washed, took on all shades of red, from rose to deep red, according to the amount of damage, in the same way as with Mark's diazo-benzene-sulphonic reagent.

3. Wool which had been dipped into a 5% aqueous sulphuric acid, rinsed, and dried for an hour at 80° C., assumed the same coloring as the preceding.

The method is so sensitive that wool, degreased with ether and merely washed with water, remains undyed, where it has not been damaged mechanically, while wool which has been washed with soda and well washed with water will assume a pale rose color throughout, proving that treatment with even a weak alkali such as soda does to some extent attack the wool substance. In material injured by sulphuric acid, only the injured parts are dyed, the rest remaining uncolored.

Weakening of Cotton Fiber by Heat

Textil-Chem. u. Colorist 95, 9 (1928).—Reference is made to a recent article in the Bull. Soc. Ind. de Mulhouse on this topic. Apart from cases in which overheating does actually harm the fiber, many cases in which this damage is supposed to have taken place have been misinterpreted. Cotton goods when thoroughly dehydrated (using this term as more emphatic than merely "dried" to any degree) lose seriously in tensile strength, but the same goods, if exposed for even a short time to ordinary moisture containing air, take up water again and regain their former strength. It appears also that a considerable rise in temperature diminishes the strength, but again only temporarily.

Printing of Alizarine Rose

Textil-Chem. u. Colorist 86, 9 (1928).—A sealed note of Oscar Scheurer, of November, 1896, deposited with the Soc. Ind. de Mulhouse, and recently opened deals with the tendency of Alizarine Rose to become dull during printing, resulting in great production losses. The author avoided this difficulty by addition of gelatinous aluminium hydroxide to the printing paste. This mix-

ture, printed upon oil-prepared cotton cloth, gives deeper rose shades than upon unprepared goods, but the clearness of the shade is equally good in either case.

Binder, who reports (in the Bull. Soc. Ind. de Mulhouse) upon the claim, remarks that no publication of an earlier knowledge of this method exists. He has examined the process and found it fully practicable.

It is not easy to criticize a process whose value in practice was pointed out in earlier times. Yet it may be mentioned that a large addition of gelatinous aluminium hydroxide (150 to 200 g. per kilo of printing paste) can conceivably occasion difficulties in obtaining uniform results. Since it is the presence of iron compounds which brings about the dulling of shade with Alizarine Rose, the means of avoiding this, proposed by Albert Scheurer, namely, the addition of a little basic aluminium chloride (a means which was proposed in a sealed note in 1908, opened in 1925), should be given the preference. The idea of the present note is, however, interesting enough to deserve comment.

New Method of Dyeing Chrome Dyestuffs on Wool and Silk

Textile-Chem. u. Colorist 86, 9 (1928).—A series of sealed notes of the years 1921 and 1922 (Soc. Ind. de Mulhouse), recently opened, cover a study of the above topic by Porkorny.

For the production of soap-fast dyeings he chooses certain chrome dyestuffs, which are dyed upon slightly pre-chlored wool. Silk, which has been printed with fatty reserves, is dyed in the cold in presence of a small amount of acetic acid. If a change in tone takes place with the dyestuff chosen, the after-chroming is carried out by padding the goods with a solution which contains 1 to 2.5% of bichromate and a small quantity of acetic acid, and then steaming for 2 to 20 minutes. The yellowish-brown, which is first obtained with Eriochrome Azurol B by working in the cold, is changed to Marine Blue by steaming. The wine-red produced by cold working with Diamond Black PV is similarly changed to black. The method is also applicable to Alizarine Yellow GG and R, and to Alizarine Saphirol.

Niederhauser comments upon this method of using chrome dyestuffs upon wool, through padding with bichromate and subsequently steaming. With wool the dyeing takes place in the usual way; the material is then worked at ordinary temperature in a bath which consists of 100 parts of a 5% sodium bichromate solution, 100 parts of water, and 10 parts of a 10% acetic acid. After rinsing, the goods are steamed for five minutes and washed. According to Pokorny, the results are equal to those obtained by chroming at the boil for ¾ hour, the usual procedure. For silk, as for pre-chlored wool, he prescribes dyeing this class of dyestuffs from a cold bath slightly acid with acetic acid. Chlored wool is preferred, for it is possible then to exhaust the bath even with dark shades. In using silk the padding is done with a solution which contains 100 parts of a 2.5% bichromate solution and 10 parts of a 10% acetic acid (water as above).

Steaming for two minutes is mentioned as sufficient for the development and fixation of the dyeing. The procedure can be used for the production of dyeings very fast to soaping on silk. The referee, in testing the method, made a large series of test dyeings on wool and on silk. Experiments upon wool confirmed the observation that padding with bichromate and subsequent steaming did accomplish the development and fixation of dyeings from many chrome dyestuffs, and that in a very sure manner. But although for certain dyestuffs the results obtained are very satisfactory, for a large number of others the process left much to be desired. The conditions prevailing during the steaming, especially the percentage of moisture in the steam, and also the duration of the passage through the steamer, are important factors for a sure development of the color. The most favorable conditions vary with the dyestuffs, and some of the latter give tones by the new method which are very different from those obtained by the usual method of chroming in a boiling bath. Furthermore, the dyeing of chlored wool is an extremely delicate affair, especially in the case of thick wool weaves, if the dystuff used shows a tendency to become fixed superficially (essentially upon the surface, for the most part). This property of chlored wool, quick dyeing and exhaustion of a cold bath is an aspect of the proposed method which suffers from different disadvantages when the product has afterward to be subjected to fulling. It is well known that the chloring of wool hinders its shrinking, which is regarded as an essential property of most wools. The necessary conditions for the different dyestuffs are not the same, and the use of the new method becomes a very delicate matter when it is a question of dyeings for which dyestuff mixtures must be used. It would hardly be possible to shade the dyeings during the process by this method.

On silk this new method does make easier the use of a group of dyestuffs which give dyeings fast to washing, and which up to the present could be used on silk only to a limited extent. The series of chrome dyestuffs available does not give the complete range of shades which are desired upon silk, especially the lighter ones. Then, too, the use of chrome is disadvantageous for the aspect and "feel" of the goods. The process, used upon silks which have been printed with a wax reserve, involves the danger of mishaps, since silk goods printed with a reserve require very careful handling.

The process appears to be new, and is certainly of interest, and ought to be of value in some cases, for example, with certain very fine grades of wool weaves which must be subjected to a minimum of handlling.

Printing Colored Reserves with Vat Dyestuffs

Textil-Chem. u. Colorist 88, 9 (1928).—A sealed note of M. R. Haller, deposited with the Soc. Ind. de Mulhouse in 1913 and recently opened, concerns itself with

a method of preparing colored reserves with vat dyestuffs under indanthrene dyestuff dyeings.

It has already been known that the salts of zinc and of manganese exert a "reserving" action toward the dyeing with indanthrene dyestuffs, a property which can be made use of for the production of white effects. By the addition of such a reserve to a vat dyestuff, for example, Indanthrene Yellow R with zinc oxide and anthraquinone, the dyestuff can be fixed in its own color tone by a single passage of the printed material through a dye bath which contains an indanthrene dyestuff. The alkali of the bath (vat) penetrates into the printing paste, and reduces the vat dyestuff through the hydrosulphite present, while the zinc and the manganese salts contained in the reserve hinder the penetration of the dyestuff itself. Good results are thus obtained, but still better results by addition of a solution of potassium sulphite to the hydrosulphite printing paste. The reduction of the vat dyestuff contained in the reserve is brought about in the printing paste in such a manner that during the subsequent dyeing the leuco base is dissolved by the alkali present and so is put into the most suitable form for fixation upon the fiber. The addition of a small quantity of zinc chloride hastens the reduction. The dyeing is carried out in about thirty minutes by the glucose-hydrosulphite-alkali method, as is usual with the indanthrene dyestuffs. The goods are then washed, soured, and again washed.

Production of Very Firm, Very Fine Fibers of Viscose

D. R., Patent No. 462,879; *Dr. Walter Vieweg in Pirna a. d. Elbe.*—Attempts have previously been made to prepare only such specially fine fibers of viscose rayon as would approximate in thickness the individual fibers of true silk, but these attempts have all been unsuccessful. Among other methods it has been proposed to subject viscose solution to spinning under tension, by spinning the viscose solution from a wide orifice and subjecting it to slow coagulation and stretching it to a desired fineness while slowly coagulating. This method has been as unsuccessful as others.

The inventor has abandoned the above idea that only through slow coagulation can a firm fiber of the sort be made. This new procedure starts with a strong coagulating bath and employs fine spinnerets, the fine filaments thus undergoing immediate coagulation and hardening. In order to give solidity to these fine fibers they are, on formation, led through a long path to the spools or the centrifuge, over glass rods or rollers which are immersed in the bath.

The viscose solution must be carefully purified and very carefully filtered. The openings of the spinneret are of 0.09 mm. diameter. The spinnert plate is located in a vertical plane, so that the fibers, as they form, issue horizontally into the bath. As coagulating bath the common acid, highly concentrated bath of sodium bisulphite, or any other which exerts a rapid and powerful coagulating action is used. The rate of spinning is about 30 meters per minute. The resistance of the liquid of the bath, which has to be overcome by the fiber as it forms and issues horizontally, causes the separate fibers to diverge from each other as individual strands in the bath (i. e., prevents them from "bunching up"), so that the action of the coagulating bath is exerted at its maximum on each fiber.

WARNS AGAINST CHEMICAL FAKES

Haynes, Addressing Annual Meeting of Institute of Chemists, Tells of Modern Alchemy

The popular idea that the chemist is a sort of modern industrial magic worker has tempted many unwary dollars into chemical get-rich schemes that are the successors to the oil well and gold mines of the Victorian era of stock speculation, said Williams Haynes in an address before the annual meeting of the American Institute of Chemists held at the Chemists' Club, on Friday, May 10.

A dinner was served prior to the meeting, and the affairs of the New York Chapter of the Institute were brought to a close for the season with the reports of the officers and the chairmen of all standing and special committees. The following were elected to serve as officers and councilors for the next season: Chairman, M. L. Crossley; vice-chairman, Frederick W. Zons; secretary-treasurer, Karl M. Herstein; national councilor, Benjamin T. Brooks; councilors, Frederick J. Kenney and Frederick W. Zerban.

The address of Williams Haynes, who is publisher of Chemical Markets, was chiefly a warning against those who are capitalizing popular interest and popular ignorance of chemistry with schemes to turn cheap raw materials into valuable products.

"The quaint notion that a chemical plant is a sort of glorified incinerator, into which we can dump corn cobs, rabbit's whiskers, common sand, or what-have-you and draw off baby food or cigarette holders, lacquers or licorice sticks, or any other valuable product for which the world is clamoring, is as foolish as the alchemist's dream of turning lead into gold," Mr. Haynes said. "Even when, as rarely happens, a very cheap raw material can be converted chemically at little cost into a valuable product in wide demand the cost of the raw material will so rise or the selling price of the finished product will be so lowered by competition that exorbitant profits cannot be for long enjoyed.

"To-day the chemical industry is the master key of the industrial world, for we are just passing out of the economic era of power-made products into the new period of chemically made products. Rayon, celotex, bakelite, lacquers, crisco are familiar household words that reveal the widespread substitution of chemically produced goods that are taking the places of the products of nature's great factories.

NEWPORT TEAM SCORES OVER AMERICAN ANILINE NINE

The baseball team sent to Passaic, N. J., on May 11, by the American Aniline Products, Inc., of New York, suffered a rather heavy defeat at the hands of the Newport Chemical Works players. The game was staged at the Passaic School Stadium and provided some very exciting playing for those who filled the grandstand. The bat work of the Newport team proved too heavy for their opponents with a resulting score of 17 for Newport and 5 for American Aniline. In the box for Newport was Joe Mikulik, a formidable pitcher who kept down the score of the visiting team to 3 runs in the first seven innings and struck out seven men. J. Pope, who relieved him in the eighth, struck out three men and allowed no hits.

Kapp, of American Aniline, made a hit that looked for a moment like a homer until Mike Zavoda, in the field for Newport, picked it off the fence in a bit of spectacular field work. Two three-base hits were made by Schaeffer and one by J. Pope, both of Newport, and two-base hits by Zavada, W. Pope, Dekker and Golabek ol Newport and Marth of American Aniline.

A return game will be played on June 8 on the grounds of the New York team.

Newport Chemical Works is a member of the Passaic Industrial Baseball League, sponsored by the Passaic Executives' Club, which is an organization of executives and foremen from almost every industry in the Passaic section of New Jersey. At present it numbers among its members the Botany Consolidated Worsted Mills, Julius Forstmann & Co., George La Monte & Sons, Manhattan Rubber Manufacturing Company, National Rubber Manufacturing Company, Newport Chemical Works, Inc., Okonite Company and the Waldrich Bleachery.

CAMPBELL ANNOUNCES NEW SULPHUR GREEN

What is believed to be the first production in the United States of a new sulphur green which is copper free has been announced by John Campbell & Co., of New York, the new dye being designated by this manufacturer as Amalthion Green Copper Free.

Copper free sulphur colors, it is explained in the description of this dyestuff, are more soluble and require less percentage of sodium sulphide than the usual type of sulphur color, with obvious advantages in the cost of application. The new color is described as a blue shade of Sulphur Green, suitable for use in the regular sulphur dyeing method. Being free from copper it is recommended for materials that must be vulcanized, and is therefore suitable for printing because it does not affect the rolls.

Previous productions of copper free sulphur colors by this manufacturer were Amalthion Brilliant Sky Blue B and Amalthion Bordeaux 3B.

LABORATORY ASSISTANT

Dye laboratory assistant wanted by cotton mill for testing dyestuffs and matching colors. Recent graduate preferred. State age, training, and salary expected. Address: Classified Box No. 528, American Dyestuff Reporter.

HOSIERY DYER

Thoroughly experienced hosiery dyer, over 20 years' experience on high-grade full-fashioned and seamless work, open for position; location no object. Address: Classified Box No. 529, American Dyestuff Reporter.

POSITION WANTED

High-grade executive, with complete, successful experience in worsted and woolen dyeing and finishing. Capable of taking charge of any dyehouse dyeing stock; worsted, woolen, cotton or rayon yarn; tops and mixes; piece goods. New England preferred. Address: Classified Box No. 530, American Dyestuff Reporter.

POSITION WANTED

Sales representative, with eight years' experience selling dyeing machinery in New England and Canada. Experienced dyer and finisher, and has high-grade references. Would connect with a large machinery builder for above territory, or with dyestuff house. Address: Classified Box No. 531, American Dyestuff Reporter.

SALES REPRESENTATIVE

A high-caliber salesman, with a successful sales record in the Passaic-Paterson districts, can obtain a permanent lucrative connection with a reputable and one of the largest manufacturers of finishing and printing gums, including a varied and complete line of silk oils, penetrants, highly scientific rayon lubricants, sulphonated oils, degumming agents, etc. This position will appeal to the man who is anxious to become a member of a nationally known, progressive institution. Replies treated with strictest confidence. Our organization is fully acquainted with this advertisement. Address: Classified Box No. 534, American Dyestuff Reporter.

POSITION WANTED

Expert chemist, many years' experience, laboratory and mill; familiar with vat colors, especially their application to animal fibers, wool, silk and fur. Opportunity for firm wanting washable novelties in silk or wool. Has devised machinery for such processes. Address: Box No. 532, American Dyestuff Reporter.

SALESMAN

Salesman wanted to sell specialties to textile and dyeing industry. Must have experience and following. Give particulars. Confidential. Address: Box No. 533, American Dyestuff Reporter.